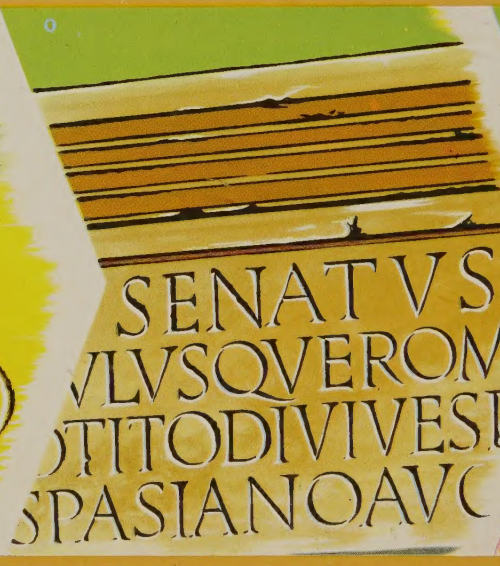
counting

reckoning dates by the moon

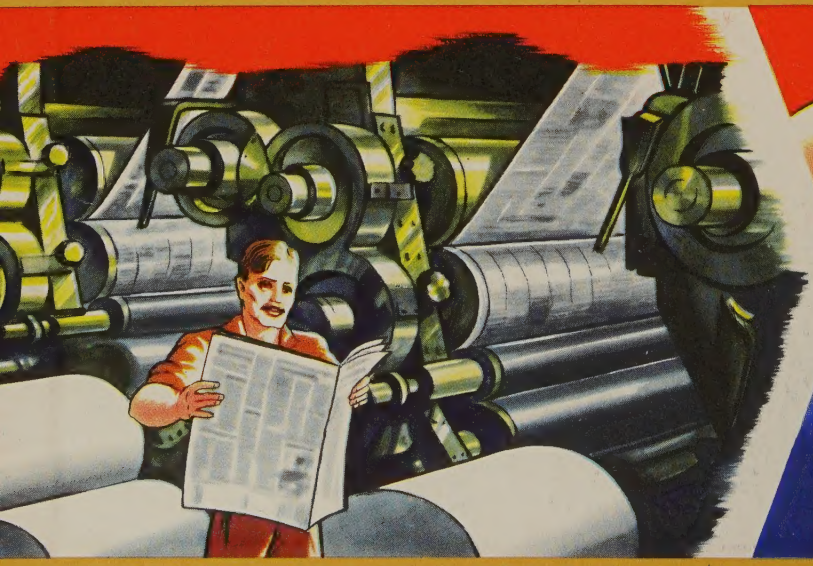
the sun tells the time

making new shapes



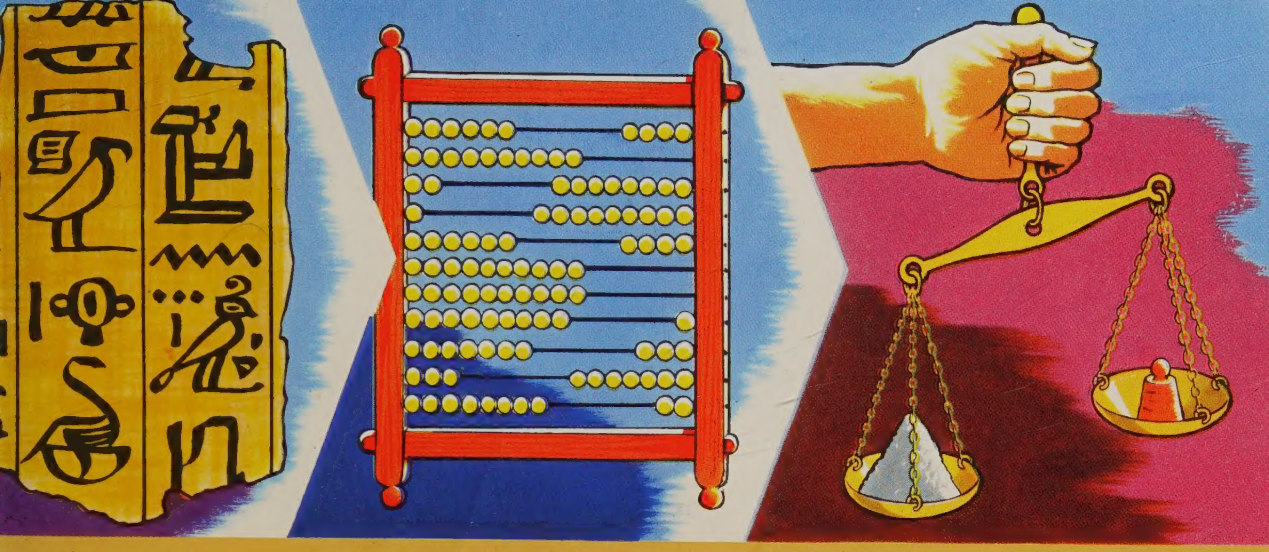
the Latin alphabet

translating the Bible



modern newspapers are produced at high speed

measuring instruments



gyptian writing

counting frame

scales for weighing

e invention of printing meant more books to read

typewriter, a writing machine

film camera

sending messages by radio

news by television

BOOK SIX

*

THE SCHOOL COMPANION

THE LAND OF THE BIBLE—A ROADSIDE SCENE IN ANCIENT PALESTINE

The Modern Children's Library of Knowledge

BOOK SIX

THE SCHOOL COMPANION

A Practical Guide to Work and Play, together with a Special Section for the Very Young and a Quick Reference Encyclopaedia for the Older Child

by

ENID BLYTON
Well-known children's author

THE REV. RALPH KIRBY
Editor of religious books

LOUISA HOLLAND
N.F.F.(T.D.)
University of Nottingham
Institute of Education

STANLEY WILSON
Diploma of Physical Education
Inspector of Physical Education
for the London County Council

HERBERT McKAY
B.Sc.
Formerly Mathematics Master,
Berkhamsted School

JACK COX
M.A.
Boy Scouts' Commissioner and
Children's Magazine Editor

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Advisory Editors:

J. A. LAUWERYS

D.Lit., D.Sc., F.R.I.C.

Professor of Comparative Education in the University of London.
Joint Editor of the International *Year Book of Education.*
Chairman of the International New Education Fellowship.
Formerly Consultant to U.N.E.S.C.O.

JACK LONGLAND

M.A.

Director of Education for Derbyshire.
Member of the Central Advisory Council for Education
in England and Wales, 1948-1951.

J. R. PEDDIE

C.B.E., M.A., D.Litt., LL.D., F.R.S.E., F.E.I.S.

Formerly Secretary and Treasurer of the Carnegie Trust for the Universities of Scotland.
Trustee of the National Library of Scotland.
Member of the Scottish Committee of the Arts Council, 1942-1954.

ANDREW SCOTLAND

M.A., Ph.D.

Director of Education for the City of Plymouth.
Author of many school textbooks.

MARY STOCKS

B.Sc. (Econ.), LL.D., Litt.D.

Principal of Westfield College, University of London, 1939-1951.
Formerly Deputy-President of the Workers' Educational Association.

R. R. TOMLINSON

O.B.E., A.R.C.A., R.B.A., P.R.D.S.

Senior Inspector of Art to the London County Council, 1925-1951.
Author of many books on Art and Art Education.
Formerly Acting-Principal of the Central School of Arts and Crafts, London.

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ALL ABOUT THIS BOOK

THIS is Book Six of *The Modern Children's Library of Knowledge*. On pages 5 and 6 of Book One you will find a description of this Library as a whole, and now you will learn some extra facts about the book you are reading at this moment. This book is a school companion and a practical guide to work and play.

It differs from the first five books in this Library since it is for a different purpose. It begins with a section for the very young children who are still learning to read. For them there are nursery rhymes, stories and simple descriptions of the things they come across in their daily lives, together with pictures of all sorts of places—the rooms of the house, the street, the country, the seaside, and so on, and all the most interesting objects in the pictures have had their names added.

Next come sections dealing in a simple way with Arithmetic and English, for counting and writing are among the most important parts of our education. What is learnt at school is told again in a way that will give the reader extra practice in correct ways of calculation and expression. This leads up to a series of tests similar to those taken by children towards the end of their primary school course for the purpose of deciding the kind of secondary education for which each child is most fitted. There are tests on Arithmetic, English and Intelligence, and young scholars who work through these tests in this book will find an improvement in the speed and confidence with which they tackle any such tests later on. Then there is a Scripture section, telling the story of Jesus. The great events in His life are described and His teachings are explained. The meaning and purpose of His life on earth thus become clear.

A section on Sports and Games comes next. Of the many games that people play, only those that children themselves play or like to watch have been chosen. The general rules of each game are given, together with useful hints which will enable young players to become better at their favourite games or to appreciate good play when they see it done by others.

The last section of this book is an Index covering Book One to Book Six of this Library. In itself it forms a quick reference encyclopaedia, giving you the main facts at a glance. If you want to find information quickly, you turn to the Index, where all the items are in alphabetical order. You look up the name of the topic that interests you and you will find certain details, together with numbers telling you in which book and on which page or pages you will find that topic treated in the course of the text.

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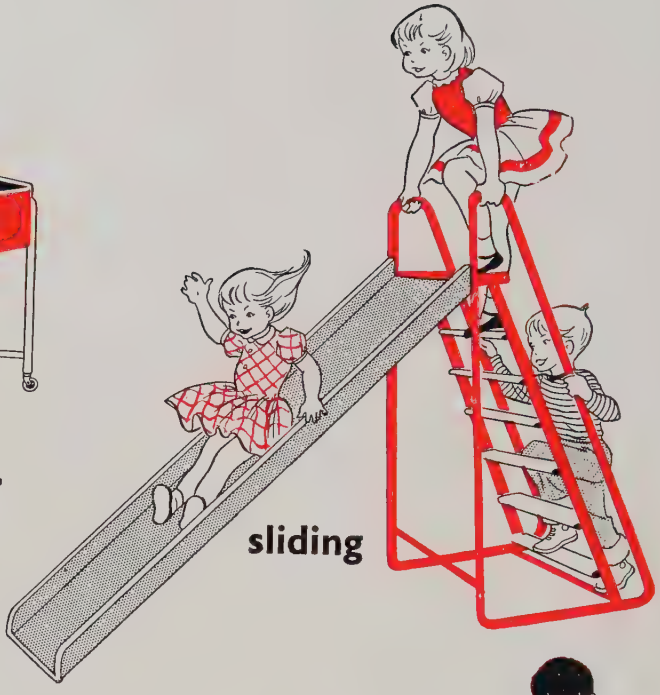
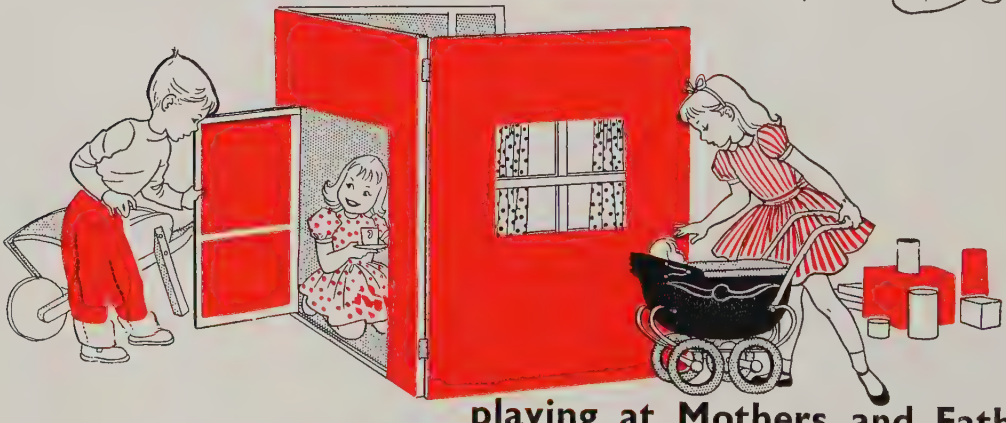
playing with water



sliding

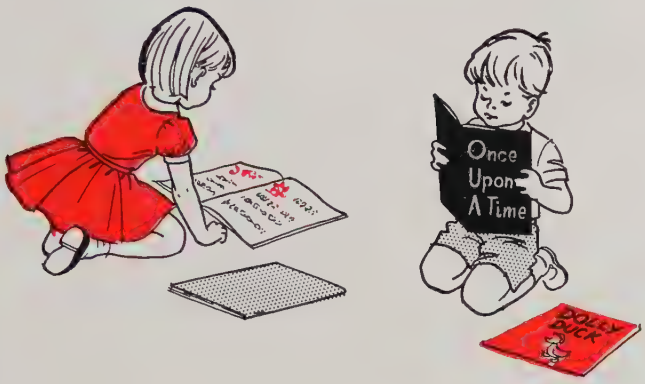
painting pictures

in the sandpit



playing at Mothers and Fathers

For the Very Young



FIRST STEPS

Hello, Children. We hope you will enjoy this book, for it has been written for you. There are pictures to look at, or to talk about. There are many rhymes, which you may already know, as well as new stories you can read for yourselves.

The first pages are very easy. If you can read, you will not have to spend much time over them. But if you cannot read very much, the first pages will help you to learn letters and words and you will find the pictures useful.

We use 26 letters when we write. They are called the alphabet or the ABC. Each letter has its own name, and put together they make up many different words. Just think of it! There are so many words, yet all are made up from these same few letters! Some letters

have more than one sound. The coloured ABC on the next four pages will show you letters having more than one sound.

When you speak you make sounds, and when you write you turn these sounds into letters. To make words we always have to put the letters in a special order.

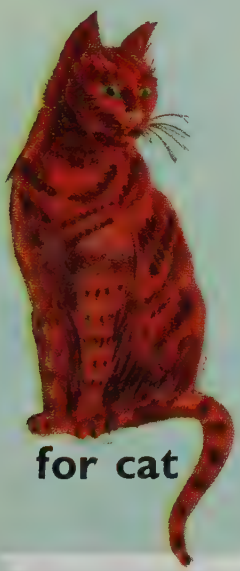
It is not easy to learn to read, write and spell, but it can be fun. This book will help you to read and to spell and to practise your writing. It will also help you to learn about figures and to do sums.

You will find pages that tell you about money, about telling the time, about weights and measures, and about shapes.

There is such a lot in this book that you will want to look at it again and again, for you can learn so much from it. Above all, I hope you will want to read other books like this. Reading is fun, so do hurry up and learn to read well.

Aa for apple and ape

Bb for ball



Cc for cat and circus

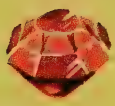
ch for chair

Dd for door

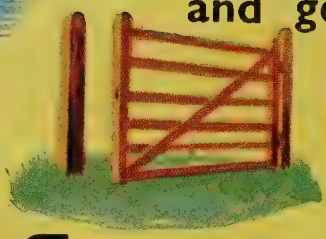
Ee for egg

and eel

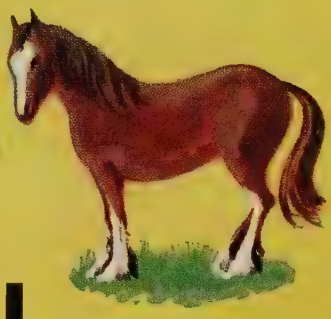
Ff for fort



and gem



Gg for gate



Hh for horse

Kk for key

Ll for lamp

Mm for milk

Pp for pen

Qq for queen

Rr for rat

Ii for ink and ice

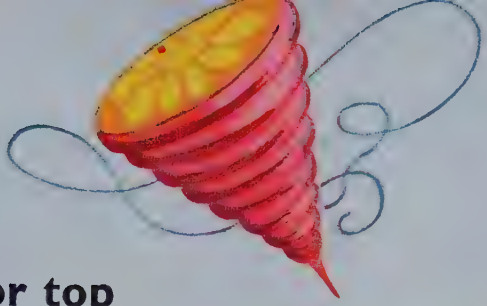
Jj for jug

Oo for oak and orange

Nn for nut

Ss for see-saw

sh for ship

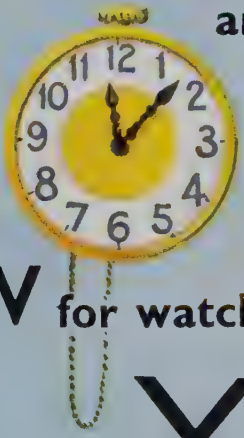


Tt for top

th for thimble

Uu for umbrella

and unicorn



Ww for watch

Vv for van

Xx as in box

Yy for yacht

Zz for zebra

NAMES

All people are known by names. All have a first name, like John or Mary, which is called the Christian name. We can have more than one Christian name. All have a last name, too, which is called the surname. Names like Smith, Brown and Jones are surnames.

When we know people well, we sometimes alter their first names. Here are some names of boys and girls, with their friendly forms as well. See if yours is among them.

BOYS	GIRLS
Anthony or Tony	Anne or Ann or Annie
Christopher or Chris	Barbara or Babs
Henry or Harry	Dorothy or Dot or Dolly
James or Jim	Elizabeth or Betty
John or Johnnie or Jack	Jennifer or Jenny
Nicholas or Nicky	Mary or May or Molly
Patrick or Pat	Margaret or Peggy
Richard or Dick	Susan or Sue
Robert or Bob	Sarah or Sally
William or Billy	Valerie or Val

pencils

WRITING

The letters on the next two pages will help you to learn to write. There are many ways of writing. You can learn all of them, for it is useful to know different kinds of writing.

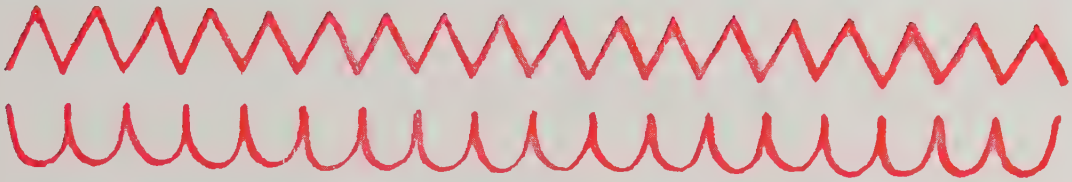
Most people know how to do print-script writing. This is very much like the printed words you find in story books. The only letters which are really different are the 'g' and the 'a'.

Then there is a hand-writing, called cursive writing, in which letters are joined together. There are many kinds of hand-writing. You will learn one of them at school.

In all writing, we use big letters, called capital letters, as well as small letters. Each letter of the alphabet has its own capital and small letters. We can write a capital A or a small a.

When you are older you will learn when to use the big and the small letters. You know already that your own name always begins with a capital letter.

If you learn to write and spell, you will be able to write to your friends, or to make up stories for yourself. This is much nicer than only being able to copy, or to have words spelt for you.



Aa Bb Cc Dd Ee

Ff Gg Hh Ii Jj

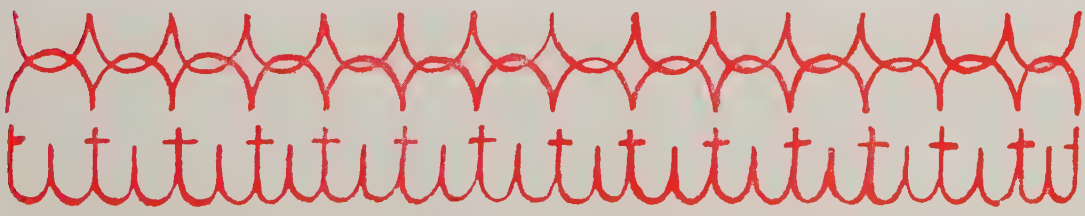
Kk Ll Mm Nn Oo

Pp Qq Rr Ss Tt

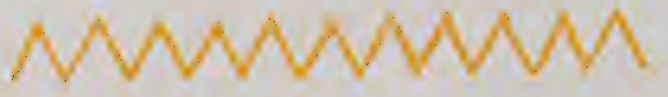
Uu Vv Ww

Xx Yy Zz

1 2 3 4 5 6 7 8 9 0

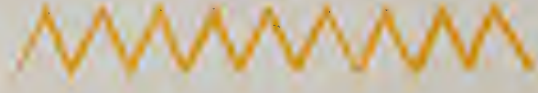


Write with a thick soft pencil.



Keep all the letters of a word close together.
Always leave a space between one word and the next.

You can begin to join up some letters.
Leave margins all round the page.



Practise every day.

See-saw, Margery Daw,
Johnnie shall have a new master;
He shall get but a penny a day,
Because he can't work any faster.

Tom, Tom, the piper's son,
Stole a pig and away he run;
The pig was eat
And Tom was beat,
And Tom went howling down the street.

Jack and Jill went up the hill
To fetch a pail of water;
Jack fell down and broke his crown,
And Jill came tumbling after.

Up Jack got, and home did trot,
As fast as he could caper;
He went to bed, to mend his head
With vinegar and brown paper.

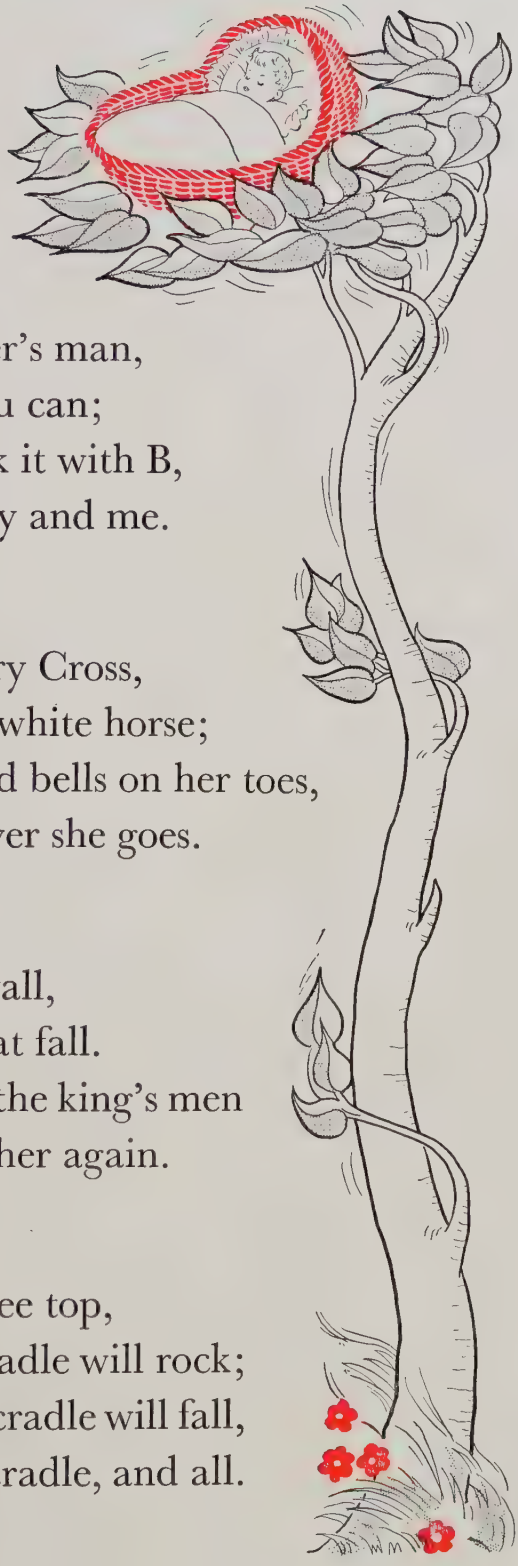
Mary, Mary, quite contrary,
How does your garden grow?
With silver bells and cockle shells,
And pretty maids all in a row.

Little Miss Muffet
Sat on a tuffet,
Eating her curds and whey;
There came a big spider,
Who sat down beside her
And frightened Miss Muffet away.

Little Bo-peep has lost her sheep,
And can't tell where to find them;
Leave them alone, and they'll come home,
And bring their tails behind them.

Curly locks, Curly locks,
Wilt thou be mine?
Thou shalt not wash dishes
Nor yet feed the swine,
But sit on a cushion
And sew a fine seam,
And feed upon strawberries,
Sugar and cream.

Pease pudding hot,
Pease pudding cold,
Pease pudding in the pot
Nine days old.



Pat-a-cake, pat-a-cake, baker's man,
Bake me a cake as fast as you can;
Pat it and prick it, and mark it with B,
And put in the oven for baby and me.

Ride a cock-horse to Banbury Cross,
To see a fine lady ride on a white horse;
With rings on her fingers and bells on her toes,
She shall have music wherever she goes.

Humpty Dumpty sat on a wall,
Humpty Dumpty had a great fall.
All the king's horses and all the king's men
Couldn't put Humpty together again.

Hush-a-bye, baby, on the tree top,
When the wind blows the cradle will rock;
When the bough breaks the cradle will fall,
And down will come baby, cradle, and all.

There was an old woman who lived in a shoe,
She had so many children she didn't know what to do;
She gave them some broth without any bread;
And whipped them all soundly, and put them to bed.

Wee Willie Winkie runs through the town,
Upstairs and downstairs in his nightgown,
Tapping at the window, calling through the lock,
"Are the children all in bed, for it's past eight
o'clock?"

Little Boy Blue,
Come blow your horn,
The sheep's in the meadow,
The cow's in the corn;
But where is the boy
Who looks after the sheep?
He's under a haycock,
Fast asleep.

Little Jack Horner
Sat in a corner,
Eating a Christmas pie;
He put in his thumb,
And pulled out a plum,
And said, What a good boy am I!

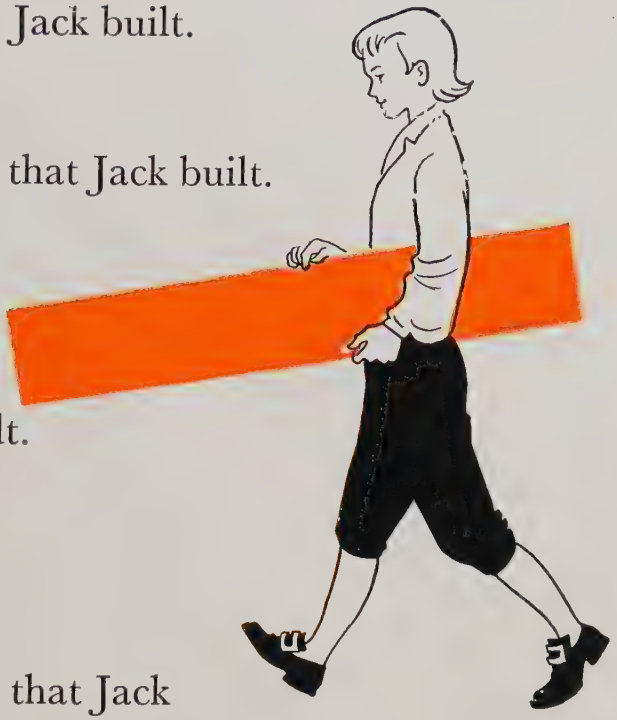
NURSERY RHYME PEOPLE—HOW MANY OF THEM DO YOU KNOW? SEE PAGE 27

THE HOUSE THAT JACK BUILT

This is the house that Jack built.

This is the malt
That lay in the house that Jack built.

This is the rat,
That ate the malt
That lay in the house
that Jack built.



This is the cat,
That killed the rat,
That ate the malt
That lay in the house that Jack
built.

and so on, adding a line to each verse, up to

This is the farmer sowing his corn,
That kept the cock that crowed in the morn,
That waked the priest all shaven and shorn,
That married the man all tattered and torn,
That kissed the maiden all forlorn,
That milked the cow with the crumpled horn,
That tossed the dog,
That worried the cat,
That killed the rat,
That ate the malt
That lay in the house that Jack built.

Hey diddle diddle,
The cat and the fiddle,
The cow jumped over the moon;
The little dog laughed
To see such sport,
And the dish ran away with
the spoon.

Baa, baa, black sheep,
Have you any wool?
Yes, sir, yes, sir,
Three bags full;
One for the master,
And one for the dame,
And one for the little boy
Who lives down the lane.

The lion and the unicorn
Were fighting for the crown;
The lion beat the unicorn
All round the town.
Some gave them white bread,
And some gave them brown;
Some gave them plum cake
And drummed them out of town.

I saw a ship a-sailing,
A-sailing on the sea,
And it was deeply laden
With pretty things for me.

There were raisins in the cabin,
And almonds in the hold;
The sails were made of silk,
And the masts were all of gold.

The four-and-twenty sailors,
That stood between the decks,
Were four-and-twenty white mice
With chains about their necks.

The captain was a duck
With a jacket on his back,
And when the ship began to move
The captain said, Quack! Quack!

NURSERY RHYME PEOPLE

The characters in the coloured picture are: Humpty Dumpty; Tom, the piper's son; the cat and the fiddle, and the cow that jumped over the moon; little Miss Muffet; the fine lady who rode a white horse; the black sheep with three bags of wool; little Boy Blue; wee Willie Winkie; little Bo-Peep; and, in the middle, the old woman who lived in a shoe.

FOUR STORIES BY ENID BLYTON

FIRST STORY—A BUSY MORNING

There was once a little boy called William Robert, and his mother used to call him Billy-Bob for short. He was a useful boy, and did all sorts of things for his mother and father. He used to run errands every day, and he really had a very good memory indeed.

One day his mother said, "Billy-Bob, please go to the grocer's and get me a packet of tea."

"A packet of tea," said Billy-Bob. "Yes, Mother."

As he went to the door his father said, "Billy-Bob, please get me a packet of envelopes."

"A packet of tea, a packet of envelopes," said Billy-Bob. "Yes, Daddy."

As he went down the path, his aunt, who lived next door, called him. "Billy-Bob, if you're going out, please get me a bag of buns for tea at our baker's."

"A packet of tea, a packet of envelopes, and a bag of buns," said Billy-Bob to himself. "Yes, Auntie."

He was just going out of the gate when his uncle came up on his way home. "Hallo, Billy-Bob," he said. "Are you off shopping? Here's some money. Buy me an evening paper, there's a good boy."

"A packet of tea, a packet of envelopes, a bag of buns, and an evening paper," said Billy-Bob. "Yes, Uncle."

He went down the road. Old Mrs. Brown knocked on the window when she saw him passing. "Billy-Bob!" she called, "please get me a pot of cream and some peppermints, will you?"

"A packet of tea, a packet of envelopes, a bag of buns, an evening paper, a pot of cream and some peppermints," said Billy-Bob. "Yes, Mrs. Brown!"

On he went, and met Mr. Jones. "Hallo, Billy-Bob!" said Mr. Jones. "Are you passing the fish-shop? Please buy me a nice kipper, will you? Here's the money."

"A packet of tea, a packet of envelopes, a bag of buns, an evening paper, a pot of cream, some peppermints, and a nice kipper," said Billy-Bob to himself. "Yes, Mr. Jones."

He went on. Soon he met Jim and Peter, and they showed him their new marbles. Then he met Susan and she told him how she had fallen down, and showed him her bandaged knee. Then after that he met Tom, who gave him a sweet and told him that his mother had made some ginger buns for tea.

"I must hurry!" said Billy-Bob to himself. He went to the grocer's and bought—well, what did he buy? He went to the stationer's and bought—can you tell me? He went to the baker's, and what did he get there? He went to the dairy and came out with—what? He went to the sweet-shop and put down the money for—can you remember? And last of all he went to the fish-shop, and asked for a nice—do you know what it was?

What a lot of parcels he had! Off he went home, and on the way he repeated the list over to himself—and, dear me, Billy-Bob had forgotten something! Yes, he had! What could it be, oh, what could it be? Yes—you are right—he had forgotten his uncle's evening paper! He met a newsboy and bought one. Now Billy-Bob was happy. He ran off home, carrying seven things—and now who can tell me what they were?

SECOND STORY—MISTER SH!

There was once a little girl whose name was Sheila. She went to school every day and loved it—but she was bad at spelling. Her dictation was really dreadful.

One day her teacher was telling the class that when the letters S and H were put together they said "Sh!" just like the noise Mother made when the baby was asleep.

"Sheila's name says 'Sh!' at the beginning," said Peter.

"And my shoes say 'Sh!' at the beginning," said Dorothy.

"So they do," said the teacher. "Well now, listen, all of you. For homework you must make me out a list of ten words all beginning with 'Sh!' That will be quite easy, and we'll see who has the best list tomorrow morning."

Well, will you believe it, when Sheila got home and sat down after tea to do her homework, she couldn't think of any more words at all—not a single one! Soon she began to cry, and her mother came to see what was the matter.

"I can't do my homework, Mummy," said Sheila. "But you mustn't help me, because my teacher says that's not fair."

"Never mind, dear," said her mother. "Go out and play a little while. Perhaps you'll be able to do it afterwards."

So out went Sheila into the garden —and to her great surprise she saw some one else there too! It was the queerest little fat man she had ever seen, no taller than she was herself. On his tunic was sewn the letter S—and when he turned round Sheila saw that the letter H was on his back.

"Who are you?" she asked in astonishment.

"I'm Mister Sh!" he said, beaming all over his face, and he held out his right hand. "Shake!" he said, and Sheila shook hands solemnly.

Then Mister Sh brought out a bag of peppermints and divided them between Sheila and himself. "Share!" he said, and they both ate them all up.

"I haven't done my homework yet," said Sheila.

"Shocking!" said the little man, pretending to look shocked. "Shameful!"

Just at that moment it began to rain, and Mister Sh sneezed. "A sharp shower!" he said, pointing to the rain. "Shall we shelter in the shed?"

They scampered to the shed and sat down there. Sheila took out her homework book and tried to think hard. Mister Sh came over beside her.

"Show me," he said. Sheila showed him the empty page.

"Shirker!" said the little man, pointing his finger at her.

"I'm not a shirker," said Sheila, crossly. "I've been trying hard to do my homework. You just see if you can do it, Mister Clever!"

"Shan't, shan't, shan't!" shouted Mister Sh, and, before Sheila's very eyes, he vanished.

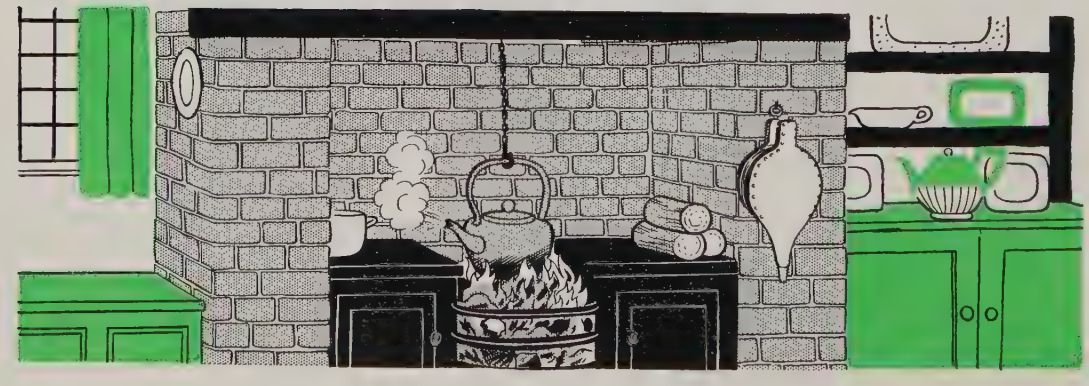
And do you know, when Sheila began to think, she found that Mister Sh had done all her homework for her! All she had to do was to write it down.

Could you write it down too? Read the story again and try!

THIRD STORY—THE VERY OLD KETTLE

Once there was a fine, shiny kettle that lived on the kitchen fire and sang a song every time it boiled. It was proud of itself. It was big and strong and bright. It had boiled water for thousands of teapots and hundreds of hot-water bottles. And then one day when Mother looked into it she saw that there was a hole in the bottom. "So that's why you make a sizzly noise on the stove!" she said. "You are leaking. What a pity! You are no good any more. You have done well, but now you must be thrown away."

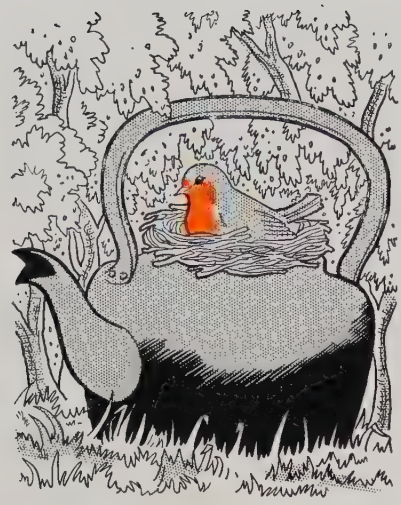
The kettle was sad. It loved the bright kitchen. It knew everything in it so well. It didn't want to be put into the dustbin for the dustman to collect. It didn't feel at all old or tired. But as Mother was going to put it into the dustbin Gillian and Imogen came along. "Oh, Mummy! Can we have that old kettle to play at houses?" asked Gillian. "We have a pretend-house under the hedge at the bottom of the garden. It will be lovely to have a kettle for boiling water when we pretend to have our tea."



So Mother gave them the kettle to play with and the kettle was happy. What a fine time it had with Gillian and Imogen! They filled it with water from the tap in the garden and set it on a pretend fire to boil. They filled their doll's teapot with the water. The kettle tried to sing, and it felt glad to be with the two happy children. Bobs the dog came along, too, and sniffed at the kettle. He even drank out of it when he found the water inside was cold. That pleased the kettle very much.

But after a time Gillian and Imogen were tired of playing houses. They left the kettle under the hedge and forgot all about it. They played Red Indians instead. The kettle was lonely and forgotten.

"This is worse than being in the dustbin!" thought the kettle. "No one comes near me. I am getting rusty and



my hole is much bigger. There are spiders' webs inside me. I shall never never be any use again. And yet I don't feel old or useless!"

One day a cock robin came to the kettle. He put his head on one side and looked inside. He called to his mate: "Here is a fine place for a nest! Look! This kettle will shelter us and our eggs well. It is a good kettle."

How pleased the old kettle was! It tried to sing as it used to do, to tell the robin how happy it would be if they would build inside it. It wasn't long before the robins began to tuck grass-roots, dead leaves, bits of moss, and many other things inside the kettle! They made a beautiful nest and lined it with hairs that Bobs and Sandy had shaken off their coats. Then they laid their four pretty eggs there.

And now the kettle is happy all day long. The hen robin sits in the nest and talks to it. The cock robin brings his wife tit-bits and sings. Soon the eggs will hatch, and how pleased the old kettle will be to feel the tiny creatures inside it, safe and sheltered!

How do I know all this? Well, you see, the old kettle and the robins' nest are in my garden! I see them every day as I walk down the path!

FOURTH STORY—
THE WIND AND THE SUN

A tale from "Aesop's Fables"

Once upon a time the Wind and the Sun had a quarrel.

"I am far stronger than you," boasted the Wind. "I can tear down chimneys, pull up trees and send ships scudding before me. You can do none of these things."

"Yet I am stronger than you," said the Sun. "You are foolish, Wind, to quarrel like this."

"Very well," said the Wind, blowing a cloud to shreds as he spoke. "We will have a trial of strength to prove which of us is the stronger. What shall we do?"

"Do you see that traveller down there?" said the Sun. "He wears a green cloak round his shoulders. Shall we say that whichever of us can get his cloak off first is the stronger of the two?"

"Agreed!" cried the Wind. "I will try first, and I tell you I shall certainly win!"

The Wind began. First of all he blew very hard round the traveller. He took hold of the man's cloak and pulled at it. He jerked it this way and that. The traveller was afraid it would be blown off, so he tied it more

tightly and held it close round his neck, for he was cold.

The Wind blew more strongly still. He called upon the rain, and drenched the man through from top to toe. The traveller shook the drops from himself, pulled his cloak even more tightly round him, and went on his way, complaining bitterly.

The Wind grew angry. He blew up a hurricane and spun the man forward, trying to rip his cloak from him. He howled in his ear. He roared for hail to come, and soon the poor man was trying to protect his head from the stinging balls of ice. He was so cold that he wished he had ten cloaks. He took off the belt from his coat and buckled it tightly round his cloak so that it could not possibly be blown away.

The Wind was defeated, and called mockingly upon the Sun to try his power. The Sun shone out and the

clouds and mist fled away. The wind was quiet, the rain stopped. The Sun shone very steadily, and his rays began to dry the traveller's wet cloak.

The man unbuckled his belt and let his cloak hang free from his shoulders, so that it might dry easily. Still the Sun shone down with a steady heat. Soon the traveller felt warm, and unbuttoned his cloak at the neck.

The Sun went on shining. The man began to puff and blow, for he grew hot. He fanned himself with his handkerchief, and took off his hat. The Sun shone and shone.

And suddenly, to the Wind's dismay, and the Sun's delight, the traveller threw off his heavy cloak, and went striding on his way without it. He could not bear the heat of it any longer!

"Gently does it!" cried the Sun to the Wind. "I've won! Roaring and blustering are never much good, you know! Gently does it!"

HOUSES AND HOMES

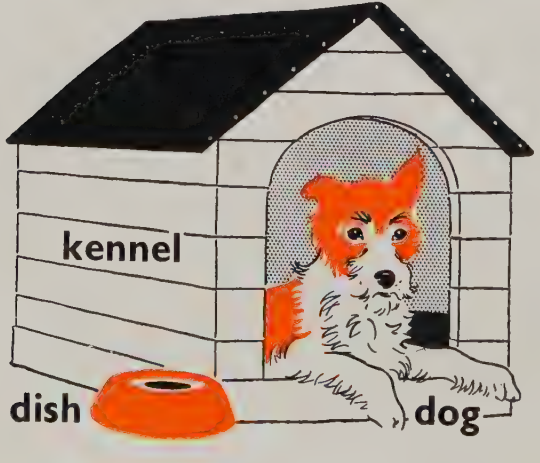
Everybody needs to have somewhere to live. The place we live in is called our home. There are many kinds of homes, but most people live in buildings we call houses. Even animals have their homes. The dog has its kennel, the tame rabbit its hutch, and hens with chicks have coops. Horses live in stables and cows in cowsheds.

Today in our country, many of our houses are built of bricks or stone.

In the towns, houses are usually in rows. One family may live in each house. Sometimes, however, people live in homes built in blocks, on top of one another. These blocks of homes are called flats.

In the country, there are very small houses called cottages, as well as larger farmhouses which belong to farmers. There are some very large houses too. These are called mansions.

Many years ago some men built big strong houses to guard themselves against enemies. These are called castles.



But perhaps the biggest houses of all today are the palaces in which kings and queens live. How many homes can you find in the picture on the opposite page?

DIFFERENT KINDS OF HOMES. WHICH DO YOU LIVE IN?

SOMEBODY'S HOME—A TWO-STOREY HOUSE AND ITS FRONT GARDEN

OUR HOUSE

The picture opposite is of the outside of a house. It has walls, a roof, chimneys, a front door and many windows.

There are two sets of windows, for inside the house are two storeys or floors, which are joined by stairs.

If the house had only one floor, it would be called a bungalow.

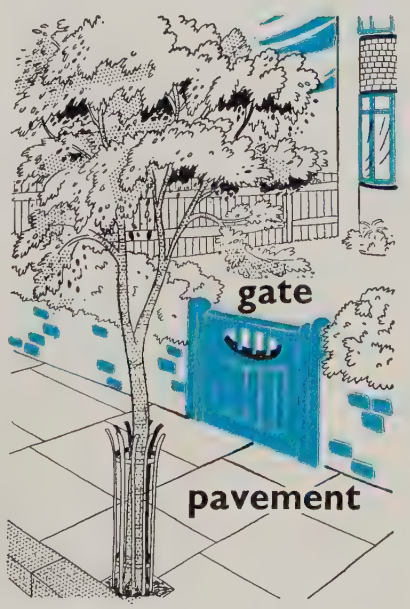
Inside most front doors, there is a space called a hall. This leads to a passage and also to the stairs.

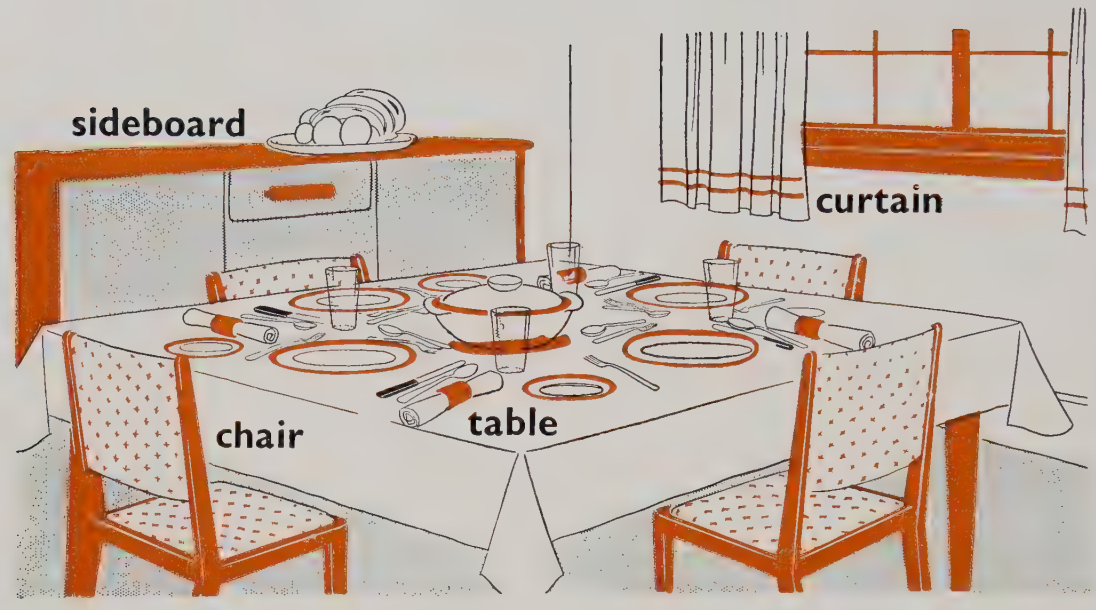
At the top of the stairs is a landing. The doors of the rooms upstairs open on to the landing. Some houses have a room right under the roof. This is called an attic.

Most houses, however, have just an empty space under the roof. This is the loft. It is usually reached by a ladder. The water-tank is often in the loft. Sometimes unwanted boxes and empty suitcases are kept there too. Sometimes the loft is made into a play-room.

Every house has a back-door or a side-door which leads outside to a yard or a garden.

Hedges or fences separate the garden from the one next door. A path will lead to the front gate. Sometimes there is a place for a car. This is called a garage.





THE DINING ROOM

The room in which we have our meals is called the dining room. Here we usually eat our breakfast, dinner, tea and supper. As we might also use it at other times, it is sometimes called the living room.

We make it cosy. There is usually a carpet or rugs on the floor, pictures on the walls and gay curtains.

In winter we have a fire in the fireplace. It can be a coal fire, a gas fire, or an electric fire.

There is a table on which to put the food, and chairs on which to sit. There is a sideboard too, where the cutlery, that is the knives, forks and spoons, are kept.

When it is time for a meal we set the table. We may put on a cloth, and have table mats too. We set out knives, forks and spoons and plates for everyone.

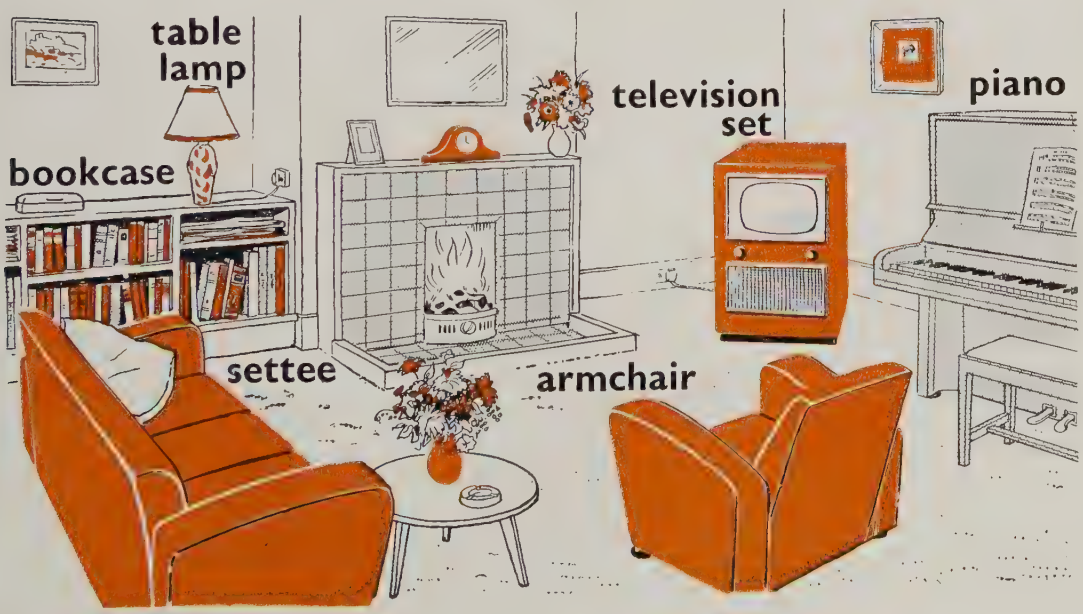
THE SITTING ROOM

The room we sit or play in after we have had our food is usually called the sitting room. Some people call it the lounge or the drawing room.

Besides the lights hanging from the ceiling, there might be a table lamp or a big standard lamp in the room.

Instead of the big dining table, there might be one or two small tables, on which we can put flowers, or a few books. There will be comfortable armchairs and a settee to sit on.

There are many things we can settle down to do in this room. We could play quietly with our toys, or take a book out of the bookcase. We might listen to gramophone records, or the piano. We can listen in to the radio, but perhaps best of all we could look at the television set, and watch the programmes for children.



THE BEDROOM

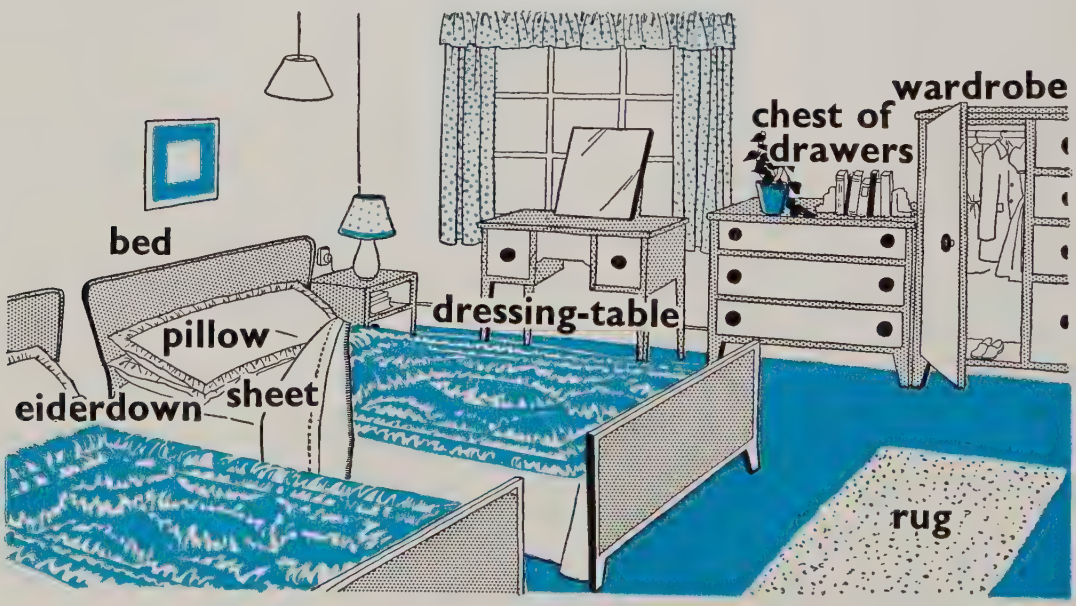
The bedroom is the room in which we sleep. There are usually two or three bedrooms in a house. Mother and Father sleep in one and the children in the others.

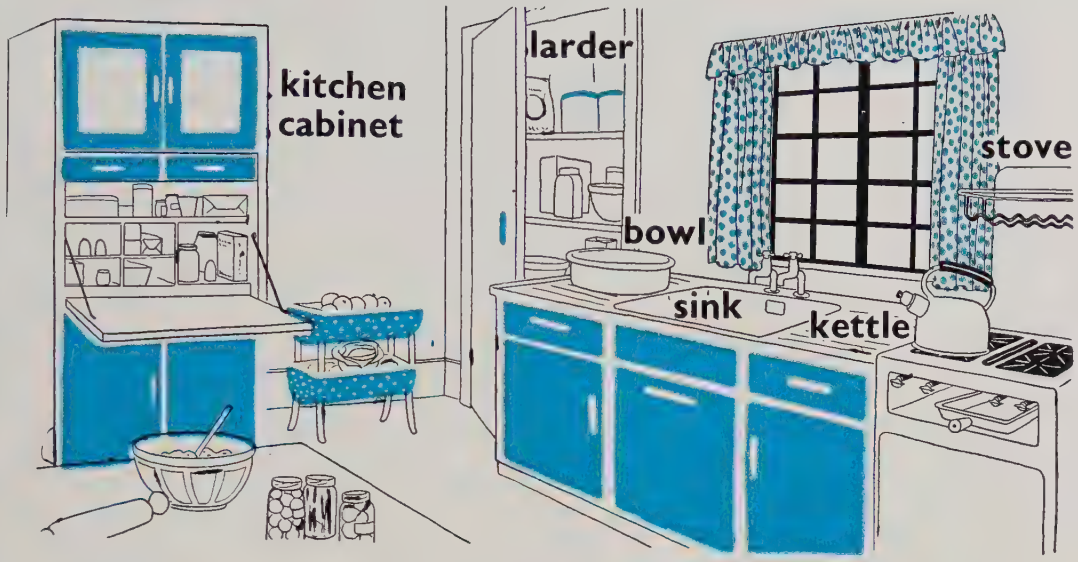
On the beds we have sheets and blankets and a bed-cover, and in winter an eiderdown keeps us warm. Our heads rest on pillows, each of which is covered with a pillow case.

In these rooms is a cupboard or wardrobe, in which we hang coats and frocks and a chest of drawers in which we keep other clothes, neatly folded.

Our combs and brushes are put on the dressing-table. This has a mirror or looking-glass in which we can see ourselves while we comb our hair.

Before we go to bed at night, we undress and wash and then put on our night clothes. Then we say our prayers, get into bed and go to sleep.





THE KITCHEN

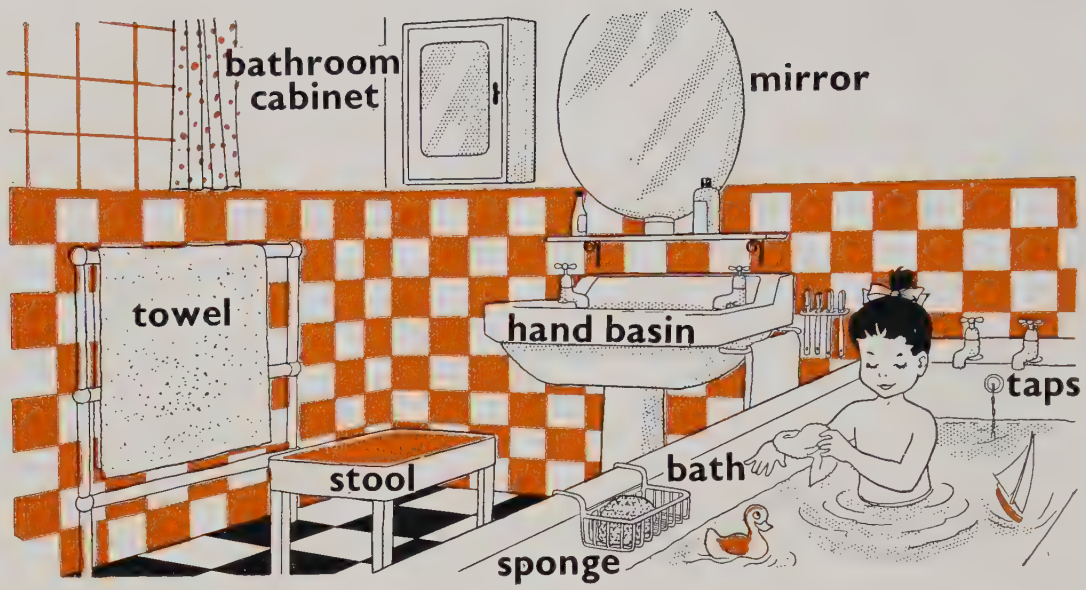
The kitchen is the room in which Mother prepares and cooks the meals and does the washing up. She may sometimes wash clothes there too.

She washes up in a bowl in the kitchen sink. She gets water from the taps above the sink.

Most kitchens have a cupboard called a kitchen cabinet in which pots, pans and dishes can be kept, a larder in which food is stored, and a table on which to prepare the food.

There is a stove for cooking or for boiling water on. This may be heated by gas or electricity. Some people also have an electric kettle.

So long as you put things away tidily and see the place is kept clean, you can enjoy yourself helping Mother in the kitchen.



THE BATHROOM

The bathroom is one of the most useful rooms in the house. Here we can wash ourselves in the hand basin or have a bath. We turn on the taps and hot and cold water come rushing out. When the bath is ready, we get into it. We put soap on the face cloth, and wash ourselves clean. We use a sponge to get the soap off. We may even be allowed to float toys in the bath water.

When we have finished our bath, we rub ourselves dry with a towel. Then we must clean the bath out, and remember to put the sponge and soap into the soap rack, and the towel on to the towel rail.

We must not forget to clean our teeth and to put the toothbrush back into the rack and the toothpaste back into the bathroom cabinet.

We must see that everything is put away tidily.

THE FAMILY

You have read about the rooms you will find in a house. But what of the people who live there?

Let us pretend that the house belongs to one family. This means that there will be a father, a mother, and some children living in it. The father and mother are the parents of the children.

The children can be boys and girls. These boys and girls will be brothers and sisters. If two of the children are of exactly the same age, they will be twins. There may be a small child too. This will be the baby.

Grandmother and Grandfather may live near enough to visit the family every day.

Then there will be other relations, like uncles, aunts and cousins, who may visit them.

If Father has a car, the family can take the relatives off for a picnic. They will all get in the car, wave goodbye to the next-door neighbours, and drive off.

THE GARDEN

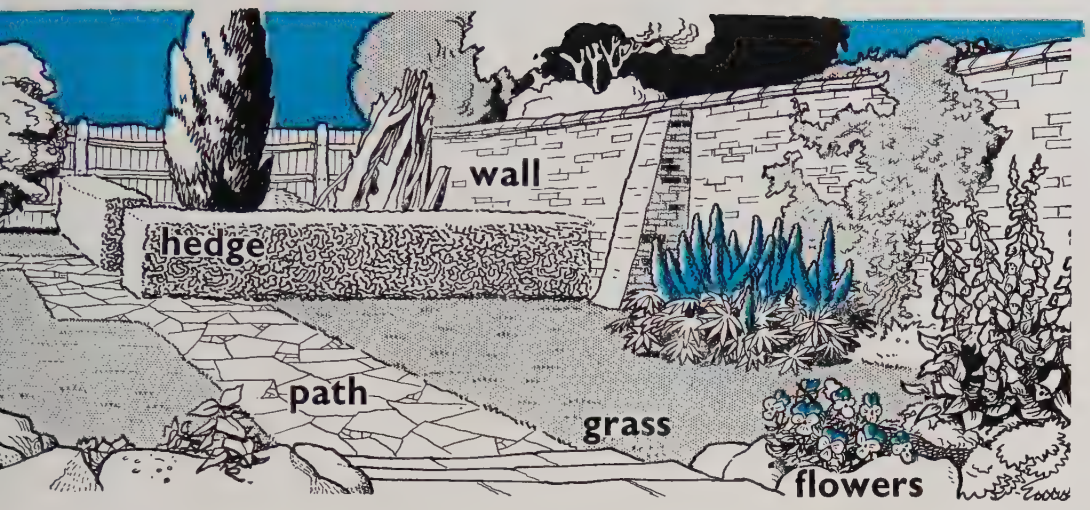
Everyone loves to have a garden where flowers can be grown.

It is a wonderful place in which to play. On dry, sunny days you can take out your toys and play on the lawn. So long as you are careful not to knock the ball on to the flower beds, you could even play cricket or rounders. Mother will watch you from her deck-chair.

In the summer the grass is green and smooth, for Daddy has mowed it well, and has trimmed the edges. It is cool on the grass. The sun shines through the trees, and birds play in and out of the branches.

The beds of flowers are a blaze of many colours. The air is scented with their smell. There will be daisies and sweet smelling stocks, snap-dragons and tall hollyhocks, as well as smaller border plants like pansies.

If you walk along the paths you can watch the



butterflies and bees sipping honey from the flowers. As you look down on the tidy paths, you will think of the autumn days when you can shuffle your feet among the fallen leaves. Perhaps Daddy will call you to ask you to help burn the leaves on the bonfire, while he digs the ground ready for next spring.

Even in winter the garden looks beautiful, for there will always be the red berries of the holly-tree to cheer you up, or the bright hips on the rose bushes to remind you of the roses in summer, or evergreen leaves on the rockery.

Very soon under the leaves you will find early snowdrops or violets to tell you that spring will not be long in coming. Later, the yellow and purple crocuses, and the golden daffodils, together with the tall straight tulips, will appear, and summer will not be far away.

So all the year round the garden is a lovely place.

BOYS' CLOTHES

All people wear clothes. There are clothes for men and women, for boys and girls, and, of course, for babies.

The pictures on the next page show you clothes for a boy. He does not wear the same kind of clothes all the time.

If it is very hot, he need only wear bathing trunks when he is playing in the garden, but he will put on a sun-hat too, to keep the sun off his head.

If it is cooler, he will change into overalls or slacks, so that he will not spoil his best clothes. He can then dig or do any odd jobs, for he knows that it will not matter if he gets his clothes dirty.

When it is colder, he will put on a shirt, shorts and socks. He may wear a woollen jersey. He will wear shoes or sandals. If he is old enough, he will wear long trousers. If it rains he will put on a raincoat; and if he wears an overcoat, his cap, woollen gloves and wellingtons, he can even go out when it snows. His clothes will keep him warm. But when the wind blows and the rain falls heavily, he will not stay out long because he will soon get wet through. Clothes take a long time

to dry, and besides, he may catch a cold and have to stay in bed.

In bed, he will wear pyjamas, and he will have his dressing gown and slippers ready to put on when he gets up.

When he goes to school, he may wear his school uniform. He will have a school tie, a belt and a school cap. He may even have a blazer, with the school badge on the pocket. He will carry his books and pencils in a satchel or a case, so that he will not lose them. All his clothes will be marked with his name, so that he will know which are his.

If he joins the Cubs, Scouts or Boys' Brigade, he will wear a special uniform. Do you know the kinds of uniform these boys wear?

GIRLS' CLOTHES

Here are some pictures showing you what clothes a girl can wear.

When it is warm she will wear a cotton frock, or a blouse and skirt, with light sandals and cotton socks.

She can play in the garden in her jeans, or if it is very hot, she will wear a sun-suit or a bathing costume. She will wear a sunbonnet to keep the sun from her head.

But when it is colder, she will wear a thick frock, and a woollen jumper instead of a blouse, or she may put a woollen cardigan over her blouse. She will wear thicker shoes and socks, and may even wear leggings to keep her legs warm when she goes out.

When she goes to school in the cold weather, she

will put on a hat, scarf and a warm overcoat. She will not have a school belt, but she may have a tie and a blazer, just like a boy. She will have a school hat-band round her hat, or she may have a beret with a badge on it instead. She may even wear a hair ribbon the same colour as her school colours.

She might have a satchel for her things, but most girls like to have a handbag too. She will keep her purse, and all her odds and ends in this handbag.

When it rains or snows she wears wellingtons, and her raincoat may have a hood to it. She can play happily in the snow and build a snowman, but she will not stay out too long in case she gets too cold.

Indoors when she is busy, or when she is helping Mother, she may wear an apron or overall, so that her clothes will not get dirty.

When it is bedtime, she undresses and puts on a nightdress, or pyjamas that are made for girls.

Girls can join clubs too. They can be Brownies, or Girl Guides, or Lifegirls. They have to wear uniforms. Can you draw a picture of a girl in a uniform ?

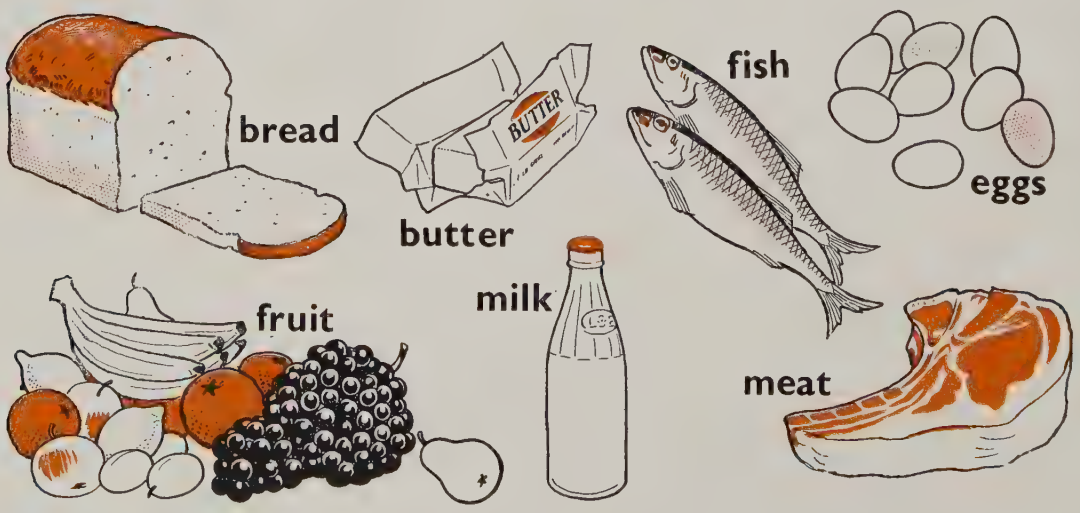
THE FOOD WE EAT

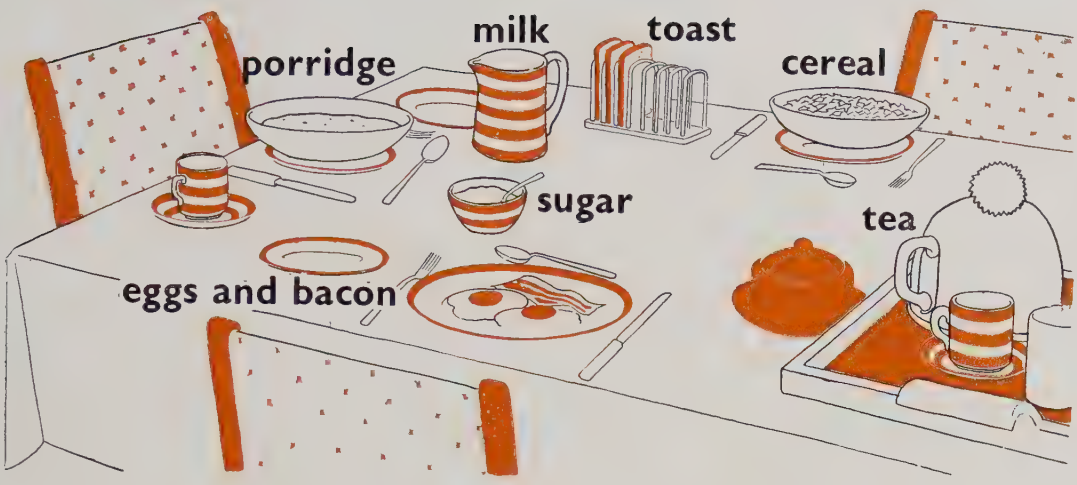
Nobody can live without food and drink. We need them to make us grow.

Mother buys most of the food from the shops, and although some of it comes from our own country, much has to be sent to us from other lands.

Daddy might grow vegetables, like potatoes, carrots and cabbages in the garden or on an allotment, but some have still to be bought.

There are many different kinds of food. Some we all need, such as milk, bread, butter, eggs, meat, fish and fruit. Bread is made from wheat that the farmer grows. Butter is made from milk that the cow gives. Hens lay eggs and meat is the flesh of animals or birds. Fish, of course, are caught in the sea. Most fruit grows on trees. Some, like apples, pears and cherries, grow in our own land, but grapes, bananas and oranges come from overseas.





BREAKFAST

The first meal of the day is breakfast. Mother will pour out tea or coffee for herself, but we might like to drink milk instead.

Our breakfast may begin with a cereal. There are many different kinds to choose from. Some people like porridge. We put sugar and milk on it and eat it with a spoon.

Then we might have something cooked—a boiled egg, or eggs and bacon, or some fish, or a slice of cold ham. For the egg we use a spoon, for the rest, knives and forks.

We remember to eat some bread or a roll, and if we are still hungry we can finish with a slice of toast and butter and marmalade. We enjoy our breakfast, but must not stay too long, for soon it will be time to go to school or to go shopping with Mother.

DINNER

The next meal we have after breakfast is dinner. Some grown-ups call it lunch, for they have a big meal at night which they call dinner. Children, however, usually have their dinner in the middle of the day. Some children stay at school for dinner, but many of them go home.

It is nice to help set the table. We must be careful to set a place for everyone. The knife goes on the right-hand side of the plate and the fork on the left. If we are having soup, we shall need an extra spoon on the right-hand side. The spoons and fork for the pudding can be put at the side or at the top of the plate. Everyone has a side plate too.

There are many dishes that we might have for dinner. Each dish is called a course. Most of us have two or three courses. For three courses we begin with soup or fruit juice. The second course is the main course. It can be meat and vegetables or fish and vegetables, or a salad. The meat might be beef, pork, or mutton or even chicken. It could be steamed, grilled or roasted. The fish could be of many kinds. Plaice, cod or whiting are favourites. It could be fried, steamed

meat and vegetables

VEGETABLES ARE PLANTS, OF WHICH SOME PARTS ARE GOOD TO EAT

THESE FRUITS COME FROM MANY DIFFERENT COUNTRIES

or boiled. It could be served with a white sauce, too.

There are many vegetables to choose from, but we are sure to have potatoes as one of them. Potatoes can be boiled or baked, or we could even have them fried as chips.

If it is a hot day we might have a salad. It might have lettuce, tomatoes, and beetroot in it, and perhaps some cucumber or spring onions. With the salad could be some fish like salmon or sardines, or some cheese or some cold meat or a hard-boiled egg.

With this course we might have sauce, salad cream, or pickles, and, of course, there would be pepper, salt, mustard and vinegar.

Perhaps the nicest course is the third course. This is the sweet, which may be a pudding. There are so many kinds we can have. They can be hot or cold. We might have a steamed pudding, like jam roll, or some tart or a pie. We might have a milk pudding, or fruit and custard. We might even have a mixed fruit salad, jelly and cream, a trifle or ice-cream.

And to end, we might eat cheese or fruit. With all these lovely things to have, dinner can be a meal full of surprises, with different things each day.

pudding

TEA

At the end of the afternoon it is teatime. Most children like to have a good tea, because it is the last full meal they will get before going to bed.

Tea can be as exciting as dinner. Besides the ordinary bread and butter, there will be different kinds of jam to choose from, as well as small cakes and biscuits. There may be a large cake too, especially if there is to be a tea-party, when friends come to tea. Then we may also have sandwiches, fruit and cream or jelly.

We often have a tea-party on our birthday. Then there will be a birthday cake with candles on it. There will be one candle for each year of our age.

If we are six, there will be six candles.

If we are seven, there will be seven candles.

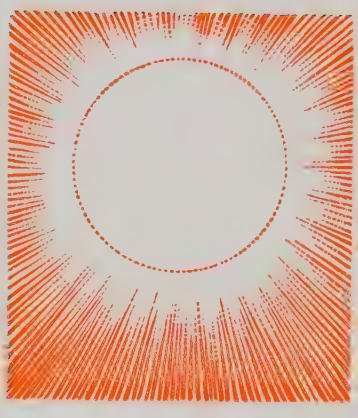
If we are eight, there will be eight candles.

The cake will be iced, and perhaps there will be words like "Happy Birthday", put on with coloured icing.

When we are ready to have the cake, the candles will be lit. We make a secret wish. Then we try to blow out all the candles at once. If we do, it is said that we shall get our wish. When the candles are blown out, the cake is cut and everybody has a piece. We all sing: "Happy Birthday to you!" and everyone eats the cake. Then we play games before going to bed.

Sometimes, just before our bedtime, we will have a little supper. We might have a drink of milk, or cocoa or fruit juice, and perhaps one or two biscuits. We do not eat much supper, because if we do we shall not sleep well.

sunrise



noon

sunset

OUT OF DOORS

Have you ever thought what a wonderful place the world is ? How every morning, when you wake up, you find that another day has come and everything is just as it was when you went to bed?

The sky and the clouds are above you. The trees and flowers are still growing.

The river still runs through the country. It flows from the high mountains or hills down into the valley and through the meadows. It flows past villages and towns, until it reaches the sea.

Yes, the fields, the streams, the birds, the animals, everything is still there! But best of all, the sun may be shining. Everything looks lovely in the sunlight! Even if the sun is not out, you know that it is still there, behind the clouds.

Even at night, when it is dark, the sun is still shining somewhere. It is always there, sending out

its rays to light up the earth and to keep us all warm.

Each day is made up of morning, noon, afternoon and night. The sun rises in the morning. At midday, or noon, the sun is overhead. At night the sun sets, but it is not quite dark, for then the moon and stars come out.

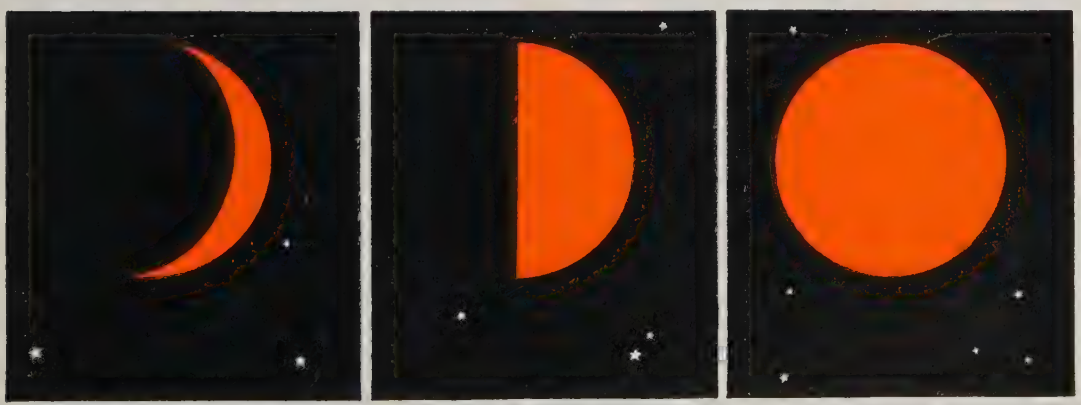
The stars are there all the time too, but you cannot see them in the daytime because the sunlight is too strong. The moon has no light of its own. It is the sun's light shining on the moon that we can see. Sometimes you can only see part of the moon.

There are pictures on these pages that show you how we see the moon.

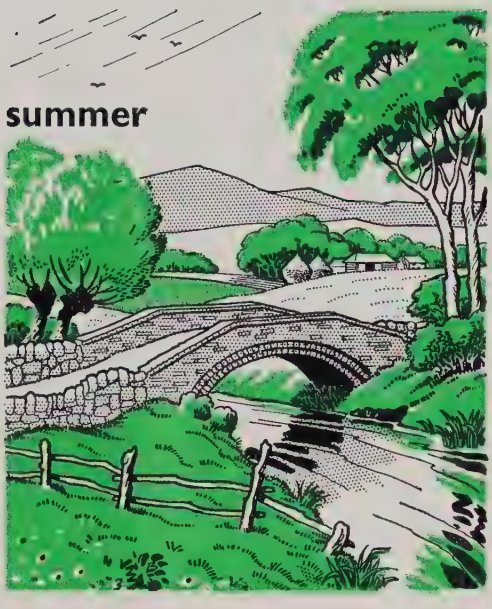
Another wonderful thing is how the seasons change. Sometimes our part of the earth is tilted away from the sun. Then the weather is colder. It is winter.

Sometimes our part of the earth is tilted towards the sun. Then the weather is hotter. It is summer.

In between we get times when it is beginning to get warm. This is the springtime. When it begins to



crescent moon **half moon** **full moon**



summer

get colder we say autumn has come.

It gets dark earlier in winter too, for the days are shorter.

Then there is the weather. As well as sunshine we get rain, wind, fog and snow. Rain helps to make things grow and fills the streams and rivers. All the water that we drink comes from the rain.

When it is hot, we may get storms. Then we hear thunder and see flashes of lightning. When the rain falls heavily and the wind blows hard, we say that a gale is blowing. Sometimes the wind is so strong that it blows slates off roofs and breaks branches off trees.

Fog comes when there is no wind to blow away the dirt and smoke.

The wind makes a noise but snow falls quietly. It covers the ground with a white carpet and is lovely to play with.

The world is indeed a lovely place.

winter

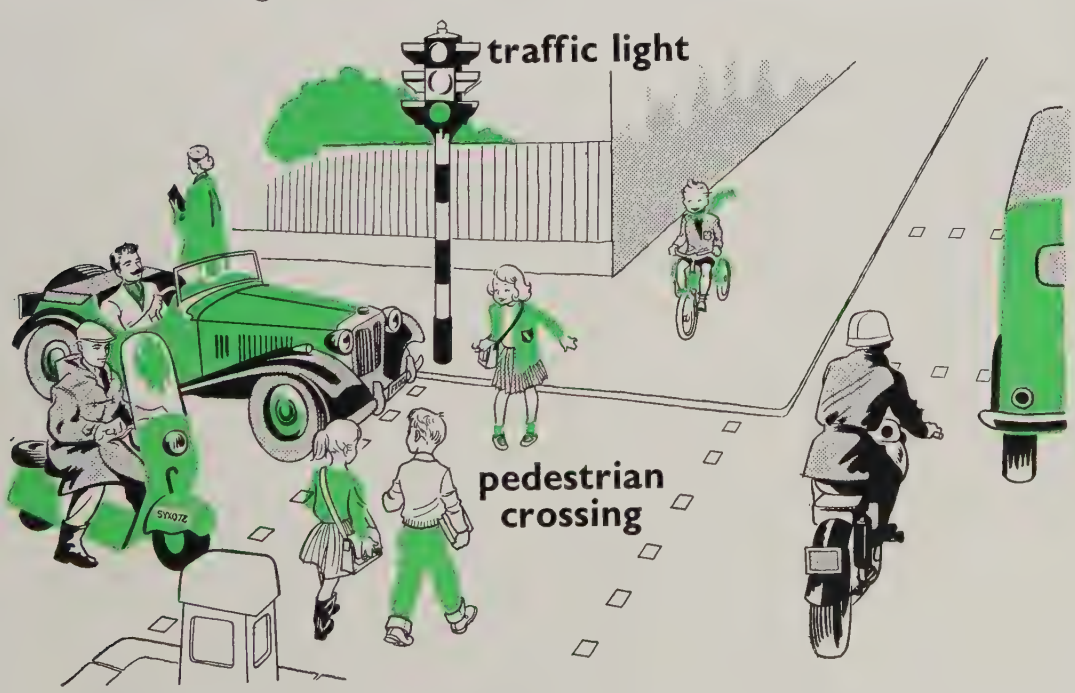
THE TOWN

The town is a busy place, for many people live and work there.

Traffic goes up and down the main streets. Buses and cars take people to and from their work in factories, offices or shops.

Where busy roads meet there are traffic lights. They show three lights—red, which says "Stop"; amber or yellow for "Caution", which means we wait; and green, which means "Go". The traffic does not move until the green light shows.

We have to be careful when we cross these busy roads. At street corners there are places where you can cross. People who walk are called pedestrians. So these crossings are pedestrian crossings. Elsewhere there are lights called belisha beacons and the road is



marked out in white stripes. Because they are striped like an animal called the zebra, these crossings are sometimes called zebra crossings. The traffic pulls up at these crossings to let you cross.

In most big towns there is a shopping centre or market place. Here there are many shops or stalls. Some shops will be large shops where you can buy almost everything. These are called Department Stores. Some are Help Yourself Stores, where the goods are put out ready for you to choose for yourself. There are smaller shops in the side streets as well. At these shops we can buy all the things we want.

Then there will be the Post Office where we buy stamps and post our letters and parcels, and the Bank where we can save our money.

There will be blocks of offices, and the Town Hall, and, of course, a Police Station, where we can go if we

want help. There may even be a hotel, where visitors to the town can stay overnight. If we want to eat, we can go to a café or a restaurant. Afterwards, we might go to a cinema to see a film, or to a theatre to see a play or pantomime.

Most towns will have garages where people buy petrol for their cars. Then, of course, there will be the coach stations and the railway station for people who want to catch coaches or trains.

High above all the shops, we shall see the steeples of churches, for every town has its churches where people go to pray. The church bells will ring to tell us when there will be a service.

Most towns have parks or playgrounds where children can safely play or feed the sparrows while mothers sit and rest.

The town is certainly a busy place.

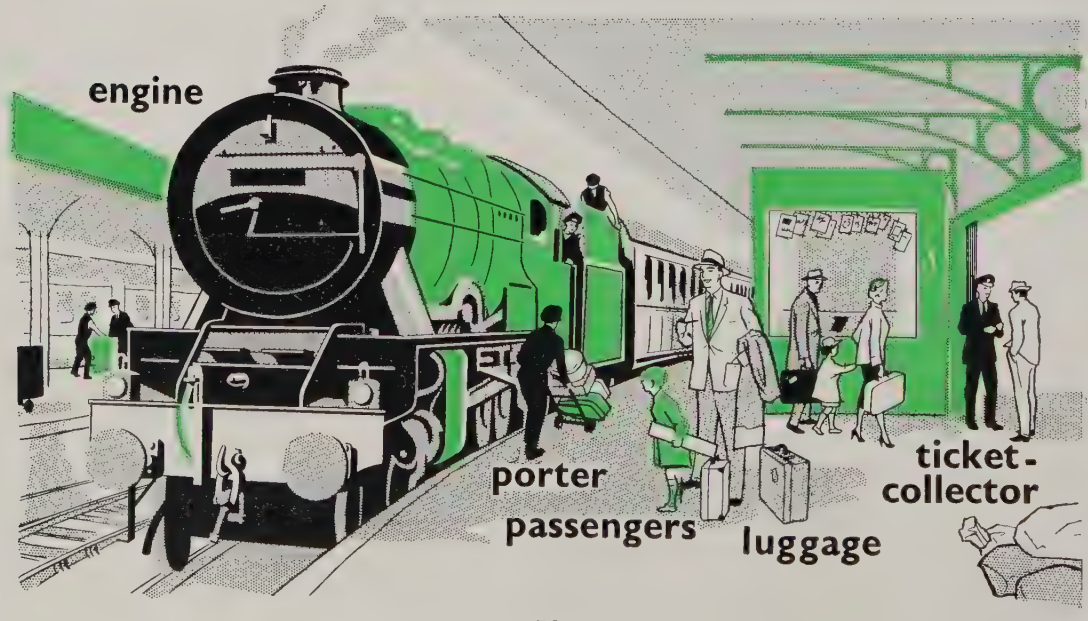
GOING SOMEWHERE

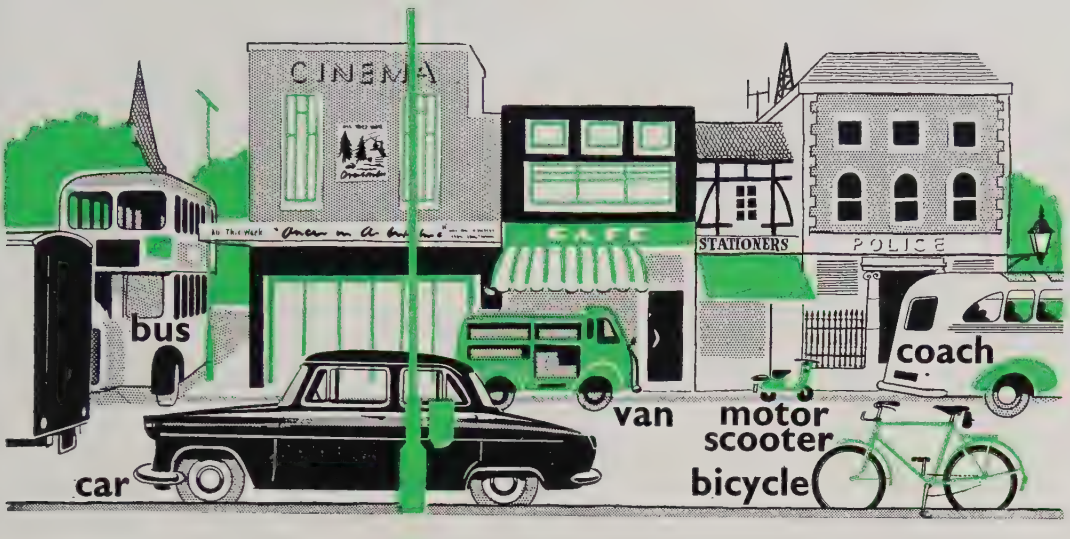
When we go from one place to another, we say we travel.

On land, we travel by rail or road. If we go by rail, we go to a railway station to catch a train. Trains are drawn by engines, which are driven by steam, electricity or oil. An engine-driver drives the train. A guard looks after the passengers.

Behind the engine, there are carriages for passengers, and vans for luggage or parcels. Sometimes there are trains which only carry goods. These are goods trains. A special train for letters and parcels sent by post is called a mail train.

When we travel by train, we buy our tickets at the ticket-office. A ticket-collector will punch the ticket as we pass through the barrier to the platform. A porter may carry our luggage, or find seats for us.





If we travel by road, we can go by coach, bus, car, or bicycle. We can also go for a short journey in a special car called a taxi.

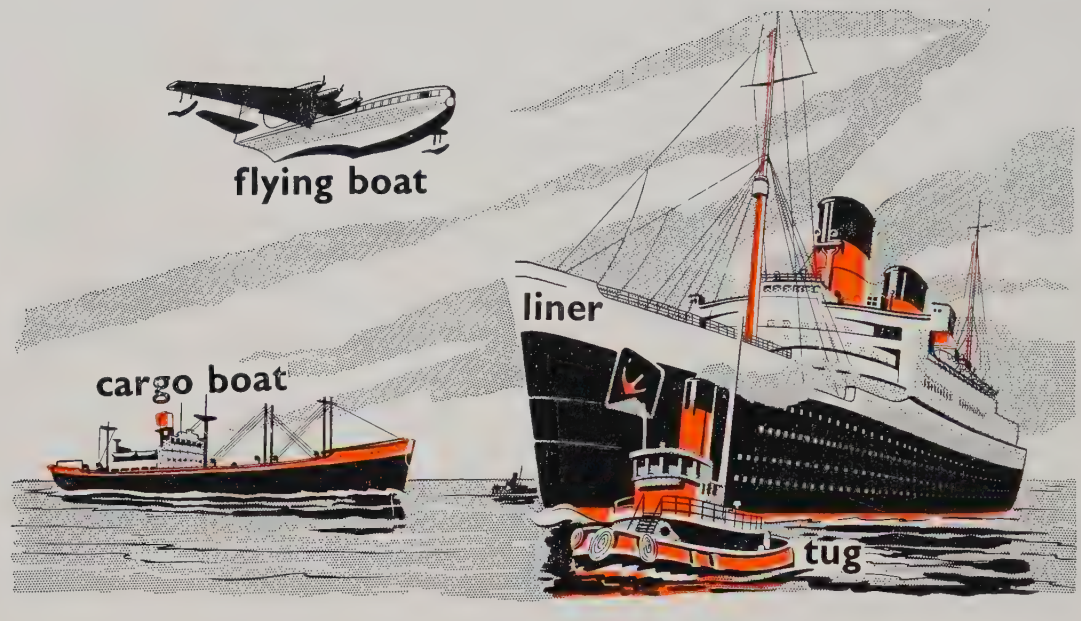
A coach can take us to the sea-side or to the country. We can also go touring in a coach.

Buses usually take us shorter distances. The driver stops at bus-stops to let people get on and off. The conductor collects the fares. We pay him money and he gives us a ticket. He rings the bell when he wants the bus to start or to stop.

Many buses are run by petrol. Others are run by electricity. These are trolley-buses. Some towns and cities have electric trams running on rails.

Goods also travel by road. They are taken in lorries and vans of all kinds.

Years ago, we always used horses to draw carts and coaches, but not many are seen today.



To travel across the sea, we have to go by ship. There are passenger ships called liners, and cargo boats which carry goods.

Ships start from ports. Ports are towns near the sea or near large rivers. In most ports there are docks where the big ships can be safely tied up. Tugs take the big boats in and out of the harbour.

Most ships are run on coal, but some use oil. In every ship there is a captain and a crew. These men are called sailors.

If we want to get anywhere very quickly, we can travel by air. Aeroplanes fly in the air, over land and sea. They start from airports, which are large fields in which to land. Some aeroplanes can land on the sea. They are called flying boats. An aeroplane is flown by a pilot, often with a crew of five or six.

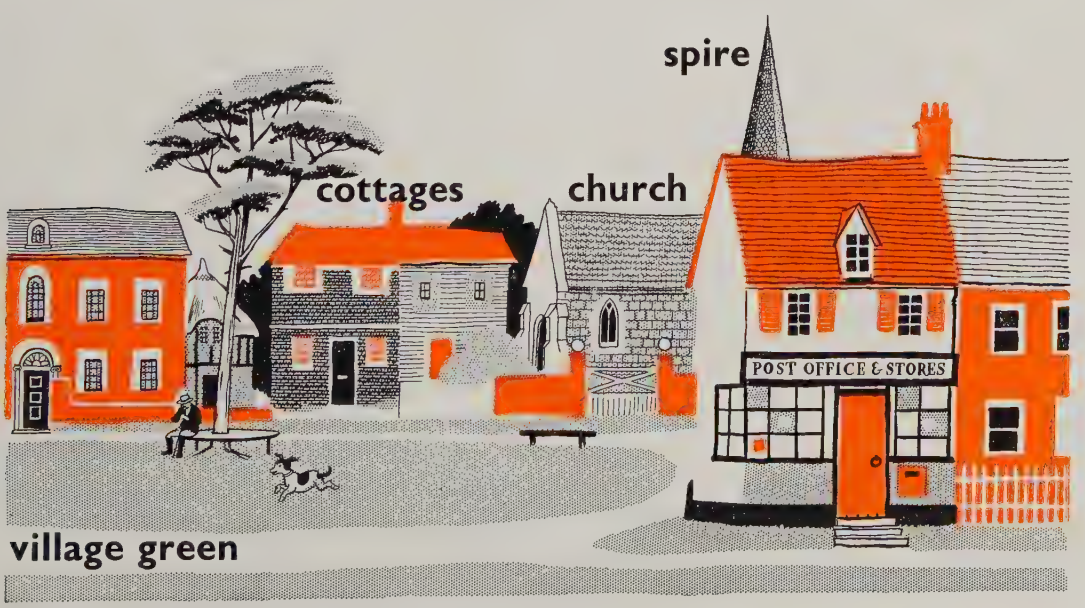
THE COUNTRYSIDE

If you live in a big town you might go to the country for a holiday.

You could stay in a small country town, or a tiny village where there will be only a few cottages and one shop.

If you go for a walk you will see fields of grass that later will be made into hay. You will pass fields of ripening corn, and come to meadows full of wild flowers. Around the meadows are hedges or stone walls to keep the animals from straying. For there will be cattle and horses in the meadows, eating grass or drinking from the stream nearby.

From the meadow you can climb up the hill to where the sheep are grazing. From the top of the hill you will look down on to the village, and see the church with its spire close by the village green.



BIRDS

When you go into the country listen to the birds singing! Most birds sing. They all sing different songs, but the song we know best is the cheep-cheep of the sparrow.

There are many kinds of birds. They all have two wings which they spread out as they fly. They have a tail which helps them to keep their balance, and two legs on which they hop. With their two sharp eyes they look for insects. They dig out worms with their strong beaks.

Birds build nests for their young in the spring. Many birds build them in trees or hedges.

Blue tits will nest in boxes hung up in the garden. The lark's nest is in the middle of a field. Sparrows and house martins nest under the eaves of houses.

Ducks and swans build their nests in the reeds by the river. These birds can swim as well as fly.

First the father and mother bird find grass, twigs, or mud to make the nest. Then the mother bird lays the eggs, and both take it in turns to sit on the eggs to keep them warm. Presently the little birds are hatched. Their father and mother bring them food, and help them to fly.

bird's nest

a tree in spring

a tree in summer

TREES

On this and the next page there are pictures of the same tree. They show the tree in spring, summer, autumn and winter.

There are many kinds of trees. They each have a trunk, branches, leaves, flowers and fruits, but on each tree they are of a different kind. Sometimes we call these flowers the blossom.

In spring the buds on the branches begin to grow, and leaves and flowers appear. Usually leaves are green, but the flowers can be of many colours. Some trees have very small flowers. Sunshine and rain bring more food to the trees, which they take up through their roots under the ground. By the end of spring, the trees are covered with leaves and flowers.

Small animals build their homes in the trees

too, while squirrels and mice run up the trunks.

After a while, the flowers die, but inside them are seeds which grow into a fruit. Each tree has its own kind of fruit. Some you can eat, such as apples, pears, plums, cherries and nuts. Others like beech-nuts, acorns, horse-chestnuts and pine cones, you can play with, or take to school for your Nature Table.

By the end of the summer, the fruit is formed, and the leaves begin to die. For after summer comes autumn, when the leaves turn from green to brown, yellow, red and gold. The wind blows them off the trees and they lie thick on the ground. The fruit is now ripe, and also falls, or is picked off the trees.

So by winter, the trees are bare. The buds are sleeping, waiting for next spring. The small animals have collected nuts for their food, and have also gone to sleep, until the warm days waken them again.

a tree in autumn

a tree in winter

THE COUNTRYSIDE IN SUMMER, WITH FLOWERS IN THE MEADOWS

SOME OF THE THINGS WE SEE AT THE SEASIDE

THE SEASIDE

The seaside is another place we can go to for a holiday.

It is lovely down by the sea. We can do so many things. We can sit on the beach and watch the waves splashing over the breakwaters. We can listen to the water lapping over the pebbles. We can see it creep up over the sand.

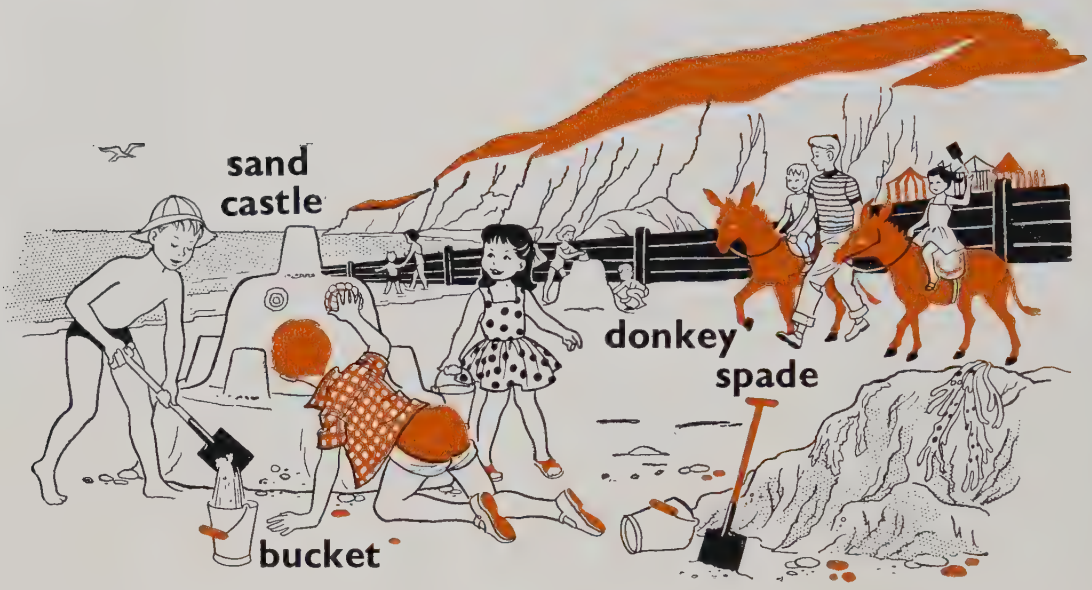
When the tide is high up on the beach we can go for a walk along the promenade, or go on to the cliffs.

We might stop at a stall to buy some rock. It will have the name of the seaside place on it.

We might listen to the band playing in the band-stand, or sit for a while to watch the Punch and Judy show.

Then we can walk slowly up the path to the cliff. From the cliff top, we can look down on to the light-house standing just off the rocks. In the lighthouse there is a lamp which is lit at night. It shines out to tell sailors and fishermen to keep their boats away from the dangerous, sharp rocks in the sea below.

We shall stay for a while and rest and watch the seagulls flying round and round the top of the cliff, before we go down again to the beach.



When the tide is out we can have fun on the beach. Mummy will sit in a deck-chair while we play cricket on the sand, or build a sand castle with a moat right round it.

If we take our shoes and socks off, we can paddle in the sea, or better still we can undress and go for a bathe. We shall take our water wings with us to help us to learn to swim.

After the bathe, we can look for shrimps and crabs in the pools. We can scramble over the rocks, or gather seaweed from the caves. We can collect shells and put them into our bucket to take home.

Later, we might go for a donkey-ride. The donkey will trot up and down the long stretch of sand.

Or we could go to the children's boating lake to sail our boats, or even go on a paddle-boat by ourselves.

If the sea is calm Daddy might take us for a row in a rowing-boat. It is lovely out on the sea. We can watch the seagulls swooping for fish. We might even try to catch fish with our rod and line.

Looking back to the beach, we might see fishermen in the small harbour. They will be mending their nets or painting their boats. We shall hear boatmen calling people to go for a ride in the big motor-boats.

After our row, we could go on the pier. A pier is a kind of long platform that stretches out from the promenade over the sand, to the deep water. Big steamers that cannot get into shallow water call at the end of the pier.

At night the pier and the promenade are lit up with coloured lights. Everything looks bright and gay at the seaside in the summer. In the winter, when the visitors have gone home, it is much quieter.

PEOPLE WHO HELP US

Have you ever thought about all the people who help us, people who come to our house, or whom we meet in the street every day ?

There are many people who work for us. There is the butcher who brings us meat, and the baker who comes round with the bread. The milkman brings the milk, and the fishmonger delivers the fish. The paper-boy brings us our daily papers. The coalman carries heavy sacks of coal, which we burn on our fires. Sometimes, the greengrocer may call with the vegetables, or the grocer-boy with the groceries. Nor must we forget the dustman who collects our rubbish, and the chimney-sweep who cleans the chimney.

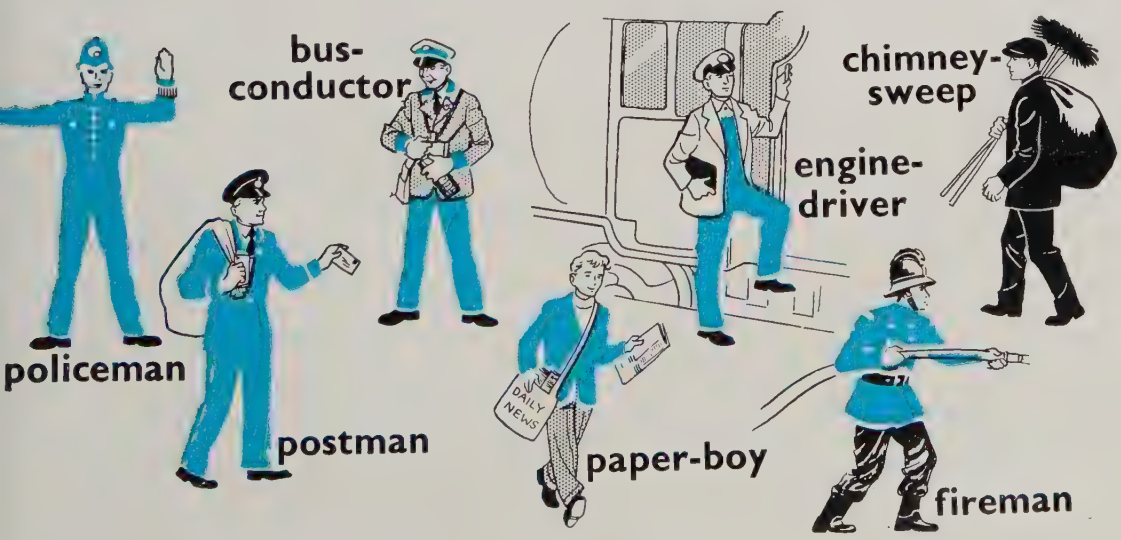
Perhaps we know the postman best, for he calls almost every day. He brings letters and parcels to us. He carries them in a bag. He rat-tats at the door. We open the door if he has parcels, but the letters he slips

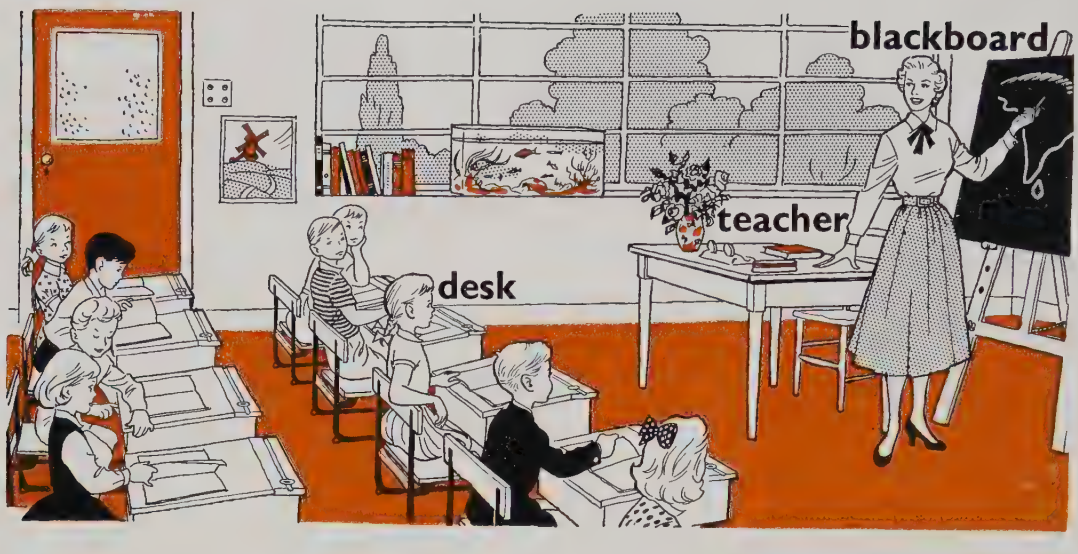
through the letter-box. We may see him in the street too, emptying the pillar box, or driving the mail-van to the Post Office.

Have you seen the firemen rushing through the streets on their fire-engines? They ring bells very loudly to let us know they are coming. The policeman holds up the traffic so that the firemen can hurry to the fire.

The policeman is our friend too. He will see us safely across the road. He will show us the way home if we get lost. He will look after our house for us when we are away. Some policemen patrol the streets in cars or on motor-bicycles. They have radios, so that they can be called quickly to go to where they are wanted.

In the streets too, we shall see the bus-driver driving his bus. If we stand at the bus stop and raise our left hand, he will stop for us. Inside the bus the conductor will take our fares and help us on and off the bus.





When we are five, we can start school. Here we will meet the teachers who will teach us, and the head teacher who looks after the whole school.

At school we learn many things. We will work in classes with other children. At first we may play with toys or sand, but soon we shall also paint and draw. We shall have books to look at, and shops to play with. We will listen to stories, and say our nursery rhymes. We will dance and sing together.

Later, we shall begin to learn to read books, to write stories, and to do sums.

We will also learn about Jesus. We will say prayers and sing hymns. Teachers will help us all the time. When we are old enough, they will take us to the baths to teach us to swim, and to the fields to play football or rounders.

They may even take us to school camp for a holiday.

If we are not well, there are many kind people who will help us to get better.

The doctor gives us medicine and pills if we need them. If we are too ill to go to his surgery, he will visit us in our home.

Sometimes we may have to go to hospital. Here there will be nurses to look after us. Nurses do what the doctors ask them to do.

You must often have seen ambulances going through the streets. These take people to and from hospital. All these people are kind to us, for they want us to get well again.

There are other people too who we must remember. There is the vicar, priest or minister from the church or chapel, whom we shall see at Sunday School. At Sunday School, we might pray for the fishermen who go out to sea to catch fish, the merchant seamen who bring us things from abroad, or the farmers who grow food for us. We might think of the miners too, who dig coal for us. Last of all, we might think of the soldiers, sailors and airmen who guard the land, sea, and air.

To all these people we say, "Thank you".

THINGS WE DO

It is lovely to play. We use our arms and legs so that we shall grow big and strong. There is much we can do.

When we go out, we walk along the street, and meet our friends.

We may hold hands and skip along together until we come to the fields.

We can climb the stile, or jump over the gate.

We can dance in a ring, or hop round on one leg, and we clap as we hop.

We can sit down on a seat.

We can kneel down, and crawl on all fours.

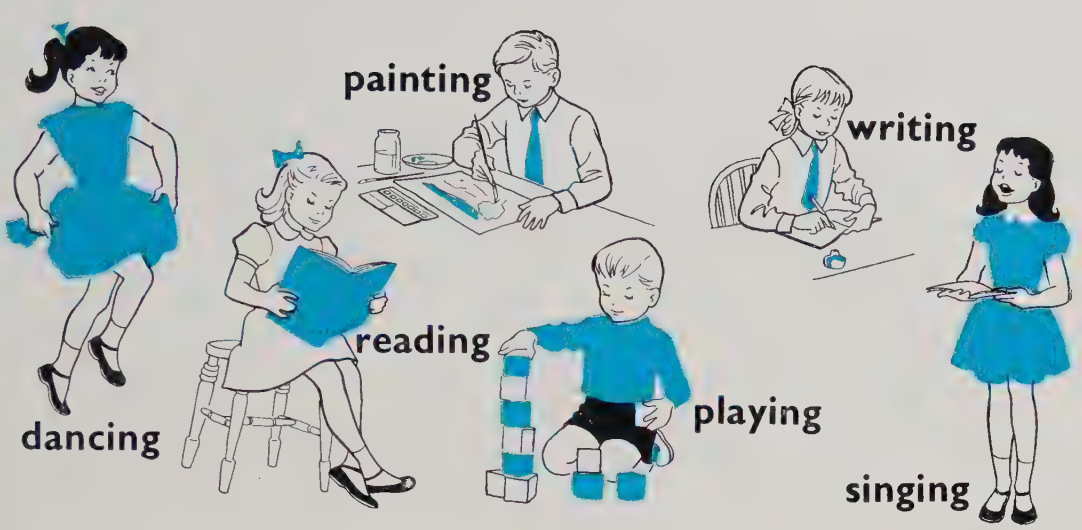
We can play ball.

We throw the ball to each other.

We stretch out our hands to catch the ball.

We can also kick the ball along the ground.

When we are tired, we bend down to pick up the ball, then lie on the grass to have a rest.



If we stay indoors, we can read a book, or take out our pencils and paper, and write. We may draw a picture with our crayons, or paint with our paint brush.

We might play quiet games like Ludo, or Snakes-and-Ladders.

We could build a castle or a tower with our bricks.

We can sing songs or dance to the music of the piano or the radio.

Or we might play at dressing up. Girls like fairy clothes, or nurses' uniform, but boys like cowboy suits or conductors' outfits.

Perhaps we will dress up in some old clothes and play at Mothers and Fathers. We pretend to bake a cake in a toy oven. We get our toy tea-set, and put the tea-things on a small table. We pretend to have tea. Then we wash up. Next we sweep up with our small broom, and dust and polish, just like Mother.

TOYS FOR GIRLS

We may play with other things too. Most girls have a doll. The doll can be undressed and put into a doll's cot, or it can be bathed in a doll's bath. It can be dressed in its outdoor clothes, put in a pram, and taken for a walk.

Girls love teddy-bears and gollywogs too. They are so cuddly. Teddy is brown or golden-yellow. It is furry and soft. Sometimes it squeaks when you press it. It can be dressed up too. Golly is black, and wears light clothes. It has frizzy black hair. Teddy and Golly can go to bed with the doll, or they can go in the pram too. They all look so good, waiting to be taken out.

Some girls have a doll's house too. It is just like a real house to look at, but it is much smaller. It has doors and windows, and a roof with a chimney on top.

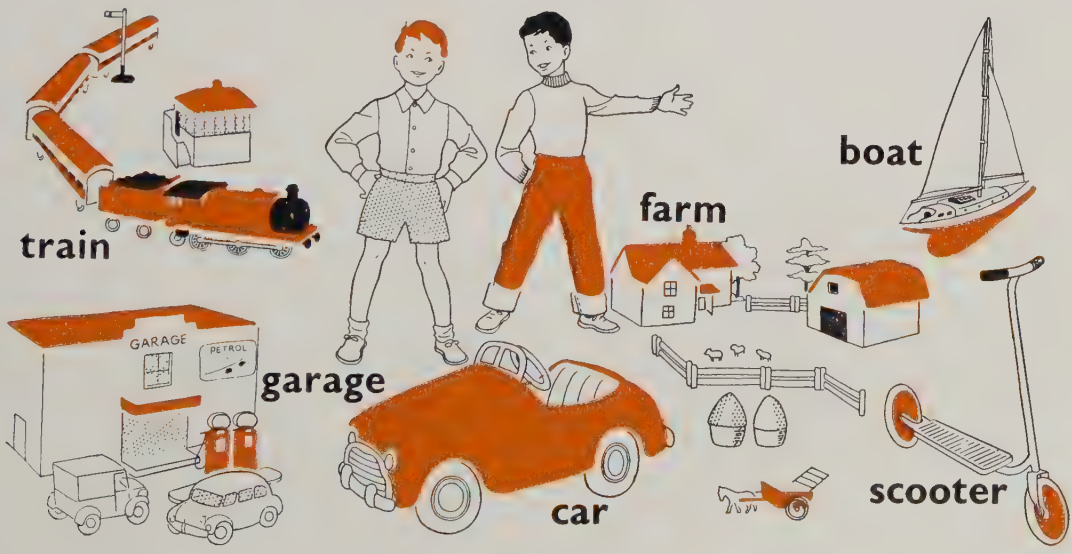
TOYS FOR BOYS

Boys love to play with toy trains. They put the rails out on the floor and make the trains run along them. They will have stations and signals, and tunnels, too.

Some boys play with toy cars and vans. They may have garages to put them in. Then there will be toy aeroplanes and ships of all kinds, with which they can play all sorts of games. But perhaps boys like toy farms or toy soldiers best.

The farm will be just like a real farm. It will have fences and hedges and gates to go round the farmyard. There will be stables for the horses, and sheds for the cows. Toy farm-carts and tractors can be moved up and down the farmyard.

The toy soldiers might be guarding a fort. There will be sentries all round it; one sentry will be at the top of the tower, where he can see the enemy a long way off.



THE WAY TO BEHAVE

No matter how young or old we are, whatever we are doing, or where we are, there are always certain ways in which we should behave towards others. This is called having good manners, or being well-behaved.

We know that we should wash our hands before we eat. We learn to use our knives and forks and spoons properly at table. We do not speak with our mouth full, or drink when we have food in our mouth. We do not stretch across the table, but ask quietly for what we want.

We say "Please", when we ask for anything, and "Thank you" when we are given something. We say "Yes, please", if we want something that is offered to us, and "No, thank you" if we do not want it. We always answer when we are spoken to, and never interrupt when someone else is speaking. We say "Excuse me", if there is something important we want to say while others are talking. We also say this, if we want to pass in front of anyone, or if someone is standing in our way.

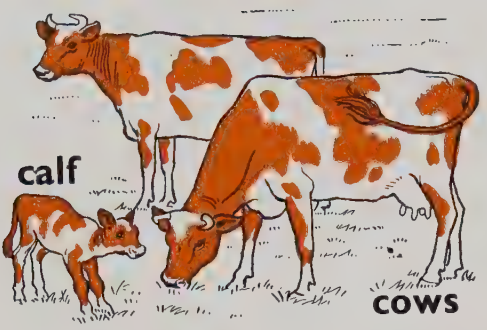
We never push in front of people, but wait our turn in shops or in bus queues.

We try not to shout or to make a noise when we are playing out of doors, and we try also not to quarrel or to get angry with one another. Indoors we remember to help clear up our toys when we have finished our play, and also to try to put them away tidily.

In trains or buses, we do not sit if grown-ups are standing, neither do we annoy people by shouting loudly, or running up and down, or changing our seats.

We should be ready to say "I'm sorry", if we make a mistake, or "I beg your pardon", if we do not hear what is said the first time. We should also say "I beg your pardon" if we knock against anybody, or get in the way.

Good manners do not cost anything. Everybody can be well behaved if they try. To be polite, is to be kind, and to be kind makes everybody much happier. So try to have good manners.



ON THE FARM

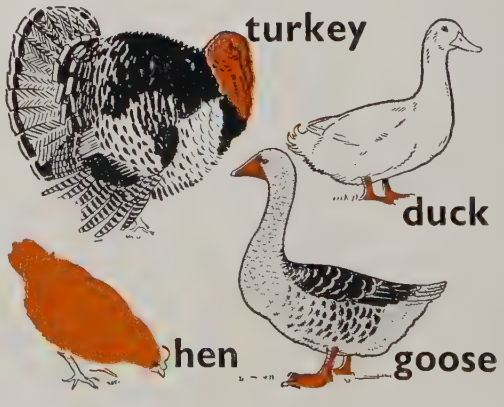
Have you ever been to a farm? If you have been in the country you will probably have seen one. The farmer lives in his farmhouse. Around the house are the out-houses, barns and stables. All round these there is usually a fence or a wall. All inside this wall is the farmyard.

Beyond the farmyard there will be the farmer's fields. In them he may grow corn or vegetables. He will have some fields for his cattle to graze in. He may have sheep too. These will graze on the short grass on the downland nearby.

Some fields will be left for long grass. This the farmer cuts and leaves to dry. Dried grass is called hay. It is stacked into haystacks and used as food for the animals in winter.

The farmyard is always a busy place. You may see the farmer's wife feeding the fowls. The chickens will run to her as she throws them the grain.

The geese and their goslings may be hissing as they strut through the yard. There may be turkeys, who



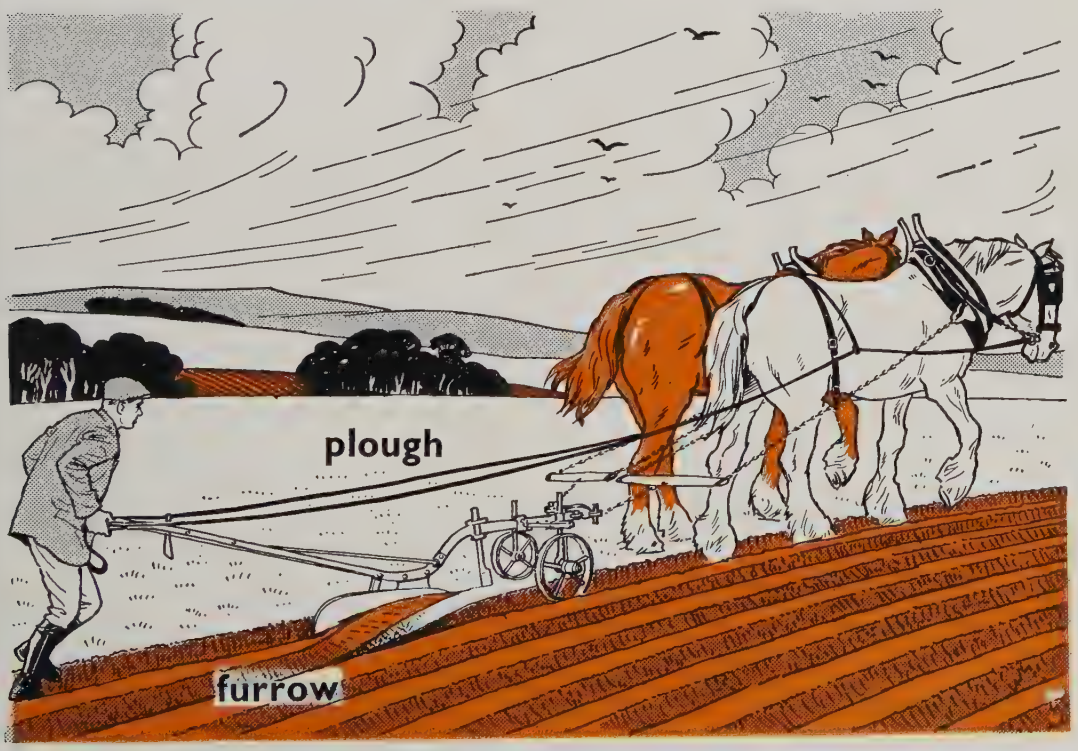
cry "gobble-gobble" as they pick up their food. The duck and drake may be quacking as they lead the ducklings down to the pond.

The milkmaid is in the cowshed helping the cowman to milk the cows.

The farmer is going to the pigsty to put the pigs' swill in the feeding trough. The sheepdogs are barking happily at his heels. The farmyard cat is hunting mice in the barn.

There is always much to do on a farm. It takes a long time to grow the food. The farmer sows the seed in the springtime, but it is autumn before it is ripe.

First he has to get the land ready. He turns the soil over. This is called ploughing. Some farmers still use horses to draw the plough, but nowadays many of



them use powerful machines called tractors instead.

When the land is ready the farmer sows the seeds. Up and down the field he goes, all along the deep straight furrows. If he sows corn, he can sow oats, barley, rye or wheat. All these are corn.

When it is ripening, the farmer may put a scarecrow in the fields to keep the birds away. Rooks and pigeons like to eat ears of corn.

In the late summer the corn will be ready for harvesting. The farmer cuts his corn. He may use a combine harvester which cuts the ears off the stalks and threshes them at the same time. But probably he will have a machine that cuts the corn and binds it into sheaves. The farm-workers will go round and stack four or six sheaves into stooks to dry. When they are dry they are loaded on to carts or vans. Then they are stored in barns or made into corn stacks ready to be threshed. This means shaking the ripe grains out of the ears.

The threshed corn is made into flour. Wheat flour is made into bread. The corn stalks are made into bundles and stacked too. This is called straw. Straw is used for bedding for the animals.

The farm is certainly a busy place.

THE ANIMALS' FEEDING TIME ON THE FARM

SOME OF THE ANIMALS THAT YOU MAY SEE AT THE ZOO

AT THE ZOO

What fun we can have at the zoo. There we shall see creatures from many lands. There is so much to see that we shall have to choose. We must see the lions and penguins at feeding time. We also want to feed the monkeys and bears ourselves. But first we shall have a ride on the elephant or the camel.

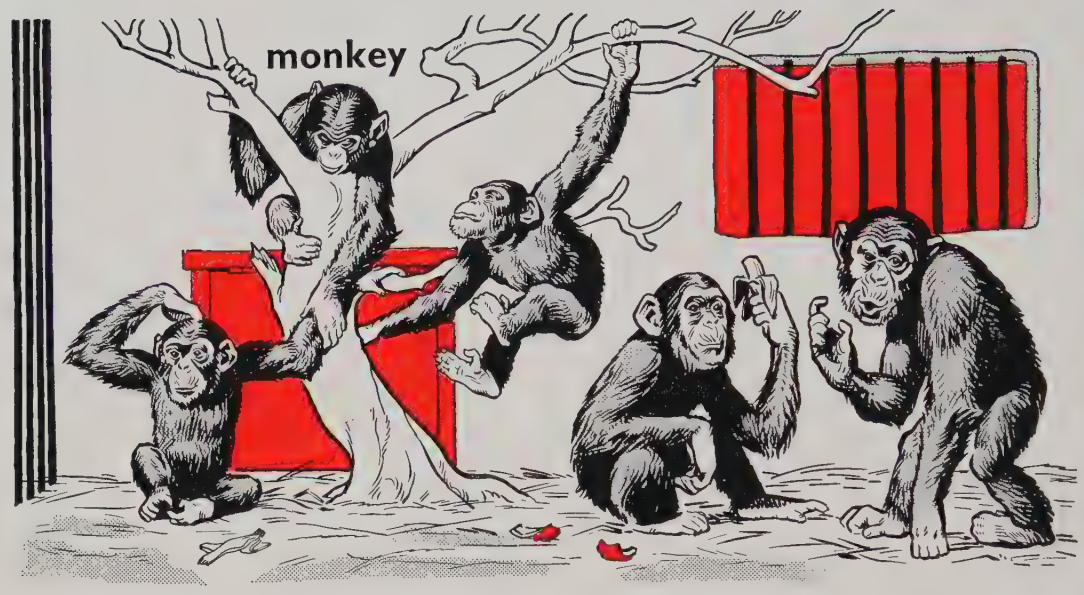
The elephant swings its trunk out to take buns and apples that people offer it. The camel holds its head high in the air. We sway from side to side in our seats on its hump. From here we can see the llama giving children rides in its cart.

When the ride is over, we go to the lion house. The lions roar as they wait for their food. The striped tigers and spotted leopards prowl up and down their cages. We watch as the keeper throws large pieces of raw meat.

We hurry on to the penguin pool. On our way we stop to throw buns to the white polar bears. They splash through the water to get them.

The penguins look smart with their black back and white front.

The keeper throws fish on to the rocks. The penguins waddle down to get it and then go for a swim.



The seals and sea-lions dive off the rocks to catch fish that the keeper throws out to them.

Next we go to the Reptile House. On the way we look at the hippopotamus and the rhinoceros bathing in their muddy tanks. We know the rhinoceros by the horn in the middle of its nose.

We see the crocodile lying as still as a log or perhaps snapping its large jaws, and the snakes curled up fast asleep.

At last we come to the monkey-house.

In a corner of a cage, one monkey sits peeling a banana. The rest are climbing and swinging in their cages. They chatter and put out their hands as if asking for food. We throw them nuts.

Now it is time to go home; and as we leave we hear the parrots screeching out goodbye.

FUN AT THE FAIR

Most towns have a fair at least once a year. The caravans and vans arrive at the park or the field that is to be the fairground. The swings and the roundabouts are unloaded. The big tower called the helter-skelter is put up.

There will be coconut shies and rifle ranges too. There will be tents where we can see sideshows. There will be games to play at which we may win a prize.

But nicest of all are the swings. We work the swing-boat ourselves, pulling hard at the rope to get up high. Up and down we go, until we are tired.

But hark, the roundabout music is playing! We climb on to a wooden animal. The roundabout moves round, and the animals go up and down. Faster and faster we go. Then slowly we stop. The ride is over. We go home tired but happy, for it has been fun.

THE CIRCUS AND ITS CLOWNS

Hurrah! The circus is here! The big tent has been put up. We pay our money and go inside.

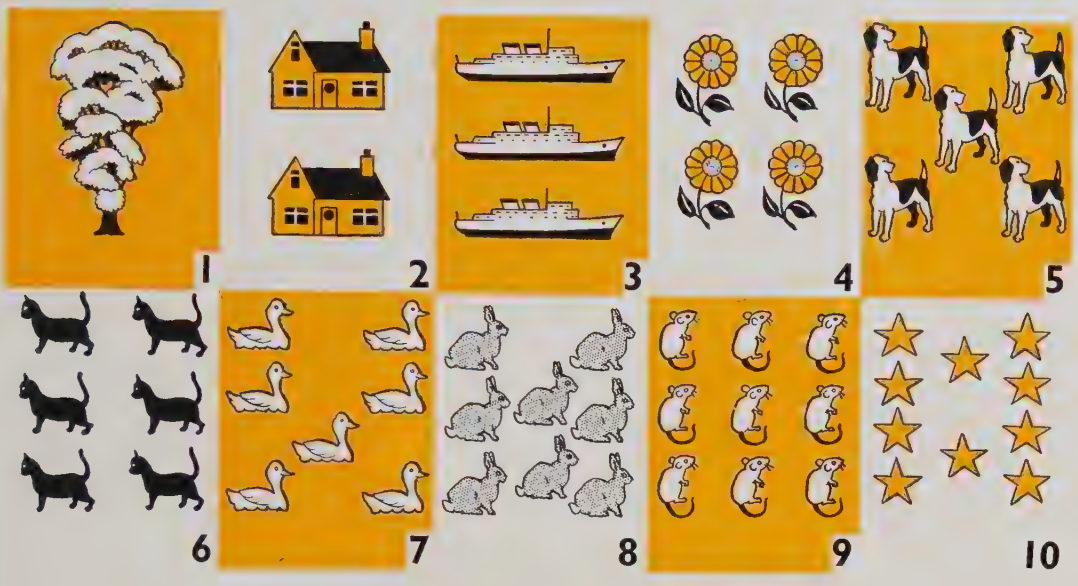
The trumpets are blown, and the horses come in and ride round and round the ring.

The sea-lions balance balls on their noses.

Acrobats swing high up in the air, and walk on tightropes.

But best of all are the clowns. They look so funny, dressed up in their baggy trousers and in coats that are too big for them. They wear comic hats. They paint their faces. They have big red noses and large white mouths.

They do all kinds of things to make us laugh. They slip on banana skins, and fall through chairs. They tumble about all over the place. We laugh until our sides ache, and we are still laughing when we go home.



NUMBERS

Can you count? If you can you will be able to play many games. As you walk along the street you can count how many steps you take. You can count the stairs as you go up to bed.

First you can count in ones, like this:

1 2 3 4 5 6 7 8 9 10

11 12 13 14 15 16 17 18 19 20

Then count in twos. Begin at 2 and leave out a number, like this:

2 4 6 8 10 and so on. These are even numbers.

Or begin at 1, like this—1 3 5 7 9—and so on. These are odd numbers. It will be better if you also learn what the numbers mean. Above are pictures and numbers up to ten, so that you can learn to count and also learn what the numbers mean.

Here are some pictures and words which will tell you more about the numbers you are learning.

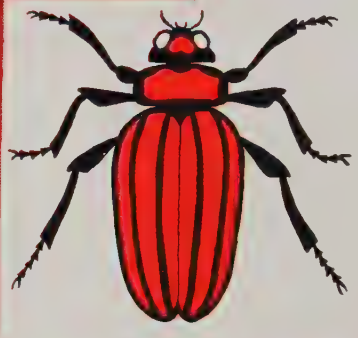
1 fish

2 wings

3 wheels

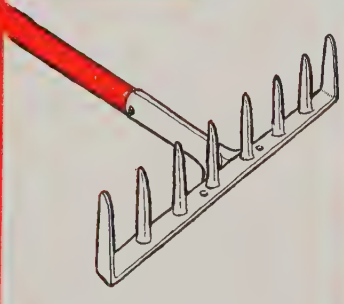
4 feet

5 petals

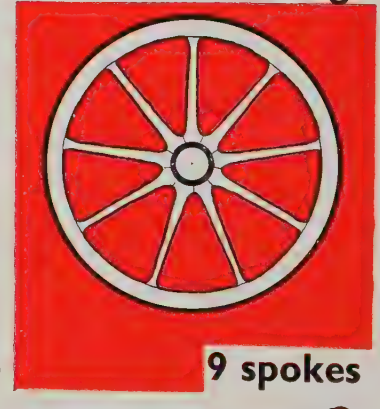


6 legs

7 leaves



8 prongs



9 spokes

10 rungs

PARTS OF MY BODY

I have 1 head and 1 face.
I have 2 ears and 2 eyes.
I have 1 nose and 1 mouth.
I have 2 lips and 2 cheeks.
I have 1 chin and 1 neck.
My neck joins my body to my head.
I have 1 body.
On my body, I have 2 arms.
On each of my arms is a hand.
I have 2 hands.
On each hand are 4 fingers and 1 thumb. So I have 8 fingers and 2 thumbs. 8 and 2 make 10.
Also on my body are 2 legs.
At the end of each leg I have 1 foot. So I have 2 feet.
On each foot are 5 toes.
5 and 5 make 10. Or 2 times 5 makes 10.
So I have 10 toes.

Here is a rhyme you can learn.

Ten little fingers, ten little toes,
Two little eyes and one little nose,
One little mouth and one little chin,
And a mouth where smiles go out and in.

NUMBER RHYMES

Here is a rhyme which tells you all the numbers up to twenty.

One two, buckle my shoe,
Three four, knock at the door,
Five, six, pick up sticks,
Seven, eight, lay them straight,
Nine, ten, a big fat hen,
Eleven, twelve, dig and delve,
Thirteen, fourteen, maids a-courting,
Fifteen, sixteen, maids in the kitchen,
Seventeen, eighteen, maids a-waiting,
Nineteen, twenty, my plate's empty.

This one will help you to count backwards from ten.

There were ten green bottles hanging on the wall,
If one green bottle should accidentally fall,
There'd be nine green bottles hanging on the wall.
Nine green bottles hanging on the wall,
If one green bottle should accidentally fall,
There'd be eight green bottles hanging on the wall.

Now you go on saying the same words. Begin "There were eight green bottles"—and take one off each time. Seven comes next, then six, five, four, three, two, one and last of all no green bottles.

TELLING THE TIME

We tell the time by looking at the hands on clocks or watches. There are 12 hours on the clock face. Each clock has two hands. The small hand tells us the hour. The big hand tells us the minutes.

The small hand moves from one figure to another in one hour. It goes round the clock twice in a day and night. There are twenty-four (24) hours in one whole day.

The big hand goes right round the clock every hour. Between each hour there are five small spaces. These are minutes. So there are 12 times 5 minutes, which is sixty (60) minutes in an hour.

Morning, that is before twelve o'clock, is called a.m. Afternoon or after twelve o'clock is called p.m.

We get up at 8 o'clock
We go to school at 9 o'clock
Dinner time is at 12 o'clock
We go back to school at 2 o'clock
Tea time is at 4 o'clock
Bed time is at 7 o'clock.

three o'clock

a quarter past six

half past nine

a quarter to twelve

WHAT IS THE DATE?

The calendar shows us time too. It shows us how the days go by. All calendars are divided into months. There are twelve (12) months in a year. They are January, February, March, April, May, June, July, August, September, October, November, December.

If you learn this rhyme, you will know how many days there are in each month.

Thirty days hath September,
April, June, and November,
All the rest have thirty-one,
Except February alone,
Which has twenty-eight days clear,
And twenty-nine days each Leap Year.

A Leap year comes once in four years.

Each month is divided into weeks. There are seven days in a week. They are Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday.

Here is a rhyme about the days, and birthdays.

Monday's child is fair of face,
Tuesday's child is full of grace,
Wednesday's child is full of woe,
Thursday's child has far to go,
Friday's child is loving and giving,
Saturday's child works hard for its living,
But the child who is born on the Sabbath Day,
Is bonny and blithe and good and gay.

DOING SUMS

When you know your figures and can also count backwards and forwards, you can start to make up sums. You can add up, take away, multiply, and divide. In writing sums down, we use special signs.

For adding up, we use a plus sign, like this +

For taking away, or subtracting, we use a minus sign, like this –

For times, or multiplying, we use this sign ×

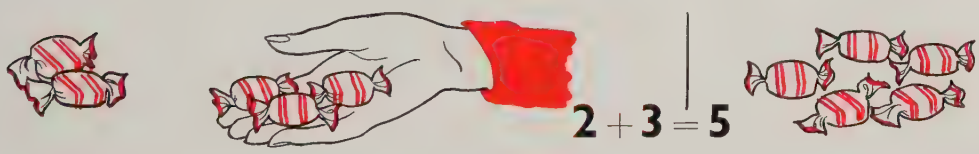
For dividing or sharing, we use this sign ÷

Another sign we have to learn is the one for makes, leaves, or equals, which is like this =

Let us try to do some sums.

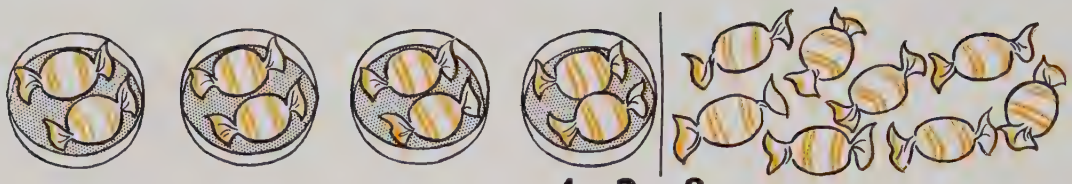
Adding up. I have 2 sweets and 3 sweets. How many sweets altogether?

2 and (or plus) 3 make 5. We write it like this 2 + 3 = 5. Do some more sums like this.



Taking away. I had 6 sweets and I gave 2 away. How many are left?

6 take away (or subtract) 2 leaves (or equals) 4 or 6 – 2 = 4. Do some more sums like this.



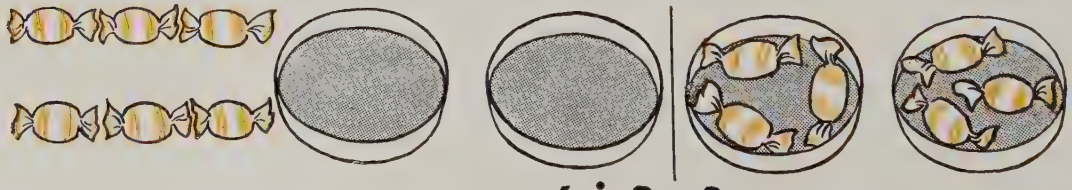
$4 \times 2 = 8$

Multiplying or "times". This is really a quick way of adding on the same number again and again. I have 4 tins. There are 2 sweets in each tin. How many sweets altogether? $2 + 2 + 2 + 2 = 8$. 4 times 2 make 8. To save time we learn multiplication tables. You will learn these at school. Then you can say $4 \times 2 = 8$.

Sharing or dividing. This is really taking away the same number again and again. I want to share out 6 sweets into 2 tins. I take away two each time and put one in each tin. I do this 3 times. $6 - 2 - 2 - 2$. There are 3 sweets in each tin.

We learn tables at school, so that we can do this a quicker way. We say, How many twos in six? We write $6 \div 2 = 3$.

These are some of the ways in which you can do sums of all kinds. You can do them with figures, or money, or weights, or measures.



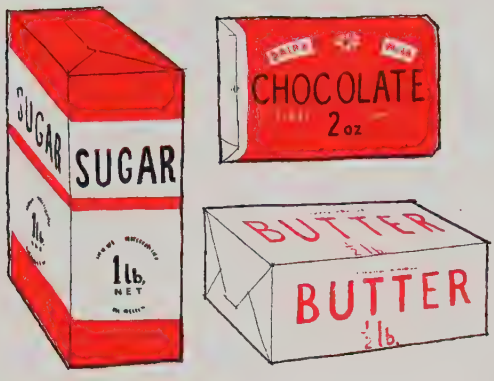
$6 \div 2 = 3$

MONEY

When we buy anything, we have to pay for it with money. In our country, we pay for the goods in pounds, shillings and pence. We write these down in a short way like this. £ stands for a pound, s for shillings, and d for pence. So £ s. d. stands for pounds, shillings and pence.

There are 12 pennies in a shilling, and 20 shillings in a pound. Pounds and ten shillings are in paper money called notes, but the rest are coins.

Here are the coins we use, and the way we write them down. When you use money you have to learn how to give and to get the correct change. It is no good trying to buy an ice cream which costs sixpence if you only have threepence, but if you have a shilling and the ice cream costs sixpence, you will want to get some change.



WEIGHT

Many kinds of goods are sold by weight. This means that they are weighed on scales before they are sold to us. The most common weights we use are ounces, half pounds, pounds, hundredweights and tons. We write these weights like this.

A pound = 1 lb. Half a pound = $\frac{1}{2}$ lb.

A quarter of a pound = $\frac{1}{4}$ lb. Ounces = ozs.

A hundredweight = 1 cwt. A ton = 1 tn.

Some things are already packed when we buy them. The weight is usually on the outside of the packet. Tea is sold in quarter and half-pound packets. Butter we buy in half-pounds, and sugar in one or two pound packets. Chocolate can be bought in small packets of two ounces, or in larger boxes which weigh a quarter, a half, or a whole pound. There are 16 ounces in a pound.

Vegetables like potatoes and cabbages are sold by the pound. Coal is sold in sacks which may weigh a hundredweight, which is one hundred and twelve pounds. There are 20 hundredweights in one ton.

As you get older you will learn more about these weights, but for now you will be getting quite clever if you learn all that is on this page.

MEASURING

Besides buying things by weight, we can also buy things by length. At the drapers' shop we can buy ribbons, cloth and curtains by the yard.

We can measure these ourselves. We do it in yards and parts of yards. Parts of yards are called feet and inches. We write these down as yd. for yards, ft. or ′ for feet, and in. or ″ for inches. There are 3 ft. in 1 yd. There are 12 in. in 1 foot. So there are 3 times 12 in., which is 36 in., in a yard.

We measure with tape measures and rulers. How tall are you ? Measure yourself and see.

Another thing we measure is distance. This is to see how far one place is from another. We measure small distances in yards, but long distances are measured in miles. There are one thousand, seven hundred and sixty yards in a mile. 1,760 yd. = 1 mile. When you go out into the country look for signposts that will tell you how many miles one place is from another.

Another kind of measure we use is called liquid measure. For instance, we buy milk in bottles, either pints or half pints. A larger bottle holds 2 pints, which is 1 quart. A very large measure is a gallon. There are 8 pints in a gallon. Daddy will buy petrol for his car in gallons.

SHAPES AND SIZES

You will all know what words like big and little mean, but do you know all about shapes and sizes? You will find some on this page. Here are some flat shapes. They are made with straight or curved lines.

A square has four sides of equal length. Oblongs have two short and two long sides.

Triangles have three straight sides. The sides can be the same length, or each can be different, or two sides can be the same. Can you tell which kinds of triangles are shown in the picture?

A circle is made from one curved line that makes a perfect round shape, like a wheel. An oval is also a curved line, but it is not a perfect round. It is rather like an egg in shape.

Stars are made from many straight lines that join to make points. Do you know any more shapes?

Arithmetic

How many runs has your school cricket team scored? You must add up the runs of each batsman to find out. How much will you have left from your birthday money when you have bought yourself a new book? You must understand how to subtract money to know that. Adding and subtracting are two of the many ways of handling figures that you learn about in the following section of the book. Other ways include multiplication, division, fractions, decimals, percentages and so on.

(1)

PLAYING WITH NUMBERS

As soon as we learn to play with numbers we quickly find out that arithmetic is not nearly as hard as we used to think.

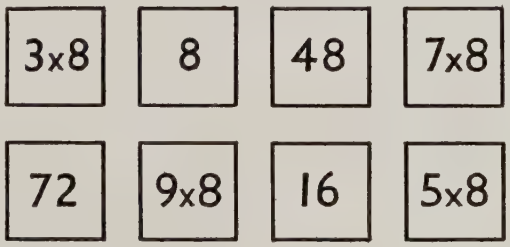
Even learning the multiplication tables can be amusing. Before we look at them, we ought to know the word "multiple"; it is a useful word to know. We get a multiple of a number when we multiply that number by any number. Six times 8 is 48; so 48 is a multiple of 8; it is also a multiple of 6. Other multiples of 8 are 16, 24, 32, 40, 56. When we learn the table of 8's we are learning the multiples of 8, up to $12 \times 8 = 96$. Of course we need not stop at 96. $13 \times 8 = 104$, so 104 is a multiple of 8; it is also a multiple of 13. $24 \times 8 = 192$, so 192 is a multiple of 8; it is also a multiple of 24.

Here is a game with multiples.

We cut out 12 small squares of paper, or from a postcard, and we use them for any table we want to learn, say the table of 8's.

We copy the table on the squares of paper: 1×8 on one side of a square, 8 on the other side; 2×8 on one side, 16 on the other side; 3×8 on one side, 24 on the other side; and so on up to 12×8 on one side, 96 on the other side.

We mix the squares, higgledy-piggledy, and we set them out in rows:



We look at the first square. We say "three 8's are 24." We turn the square over, and there it is:

We leave the square like that. The next is easy. 8 is 1×8, so we expect to find :

We say "48 is six 8's." And we find :

When all the cards have been turned, we go through them again. This time we have 24 instead of 3×8, 9×8 instead of 72, and so on.

* * *

Here is the game of Tables Snap.

We want 48 pieces of thin card; we can get them by cutting postcards in two.

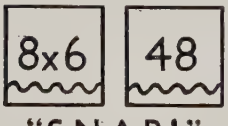
On 12 cards we write :

1×6, 2×6, 3×6, up to 12×6.

On 12 cards we write :

6, 12, 18, 24, up to 72.

On the other 24 cards we repeat this, so that we have two cards of each kind. We now have a complete set of cards for the table of 6's. We can make other sets for other tables of multiples.



We use the cards to play Snap in the ordinary way, with one difference :

8×6 snaps with 48, not with the other 8×6.

30 snaps with 5×6, not with the other 30.

* * *

When we are first learning a table we need some help in joining the pairs which match. The drawing shows how borders may be used : matching pairs have the same border. You will easily think of many more border patterns. When we are a little familiar with the table, we can go on to other games without this help.

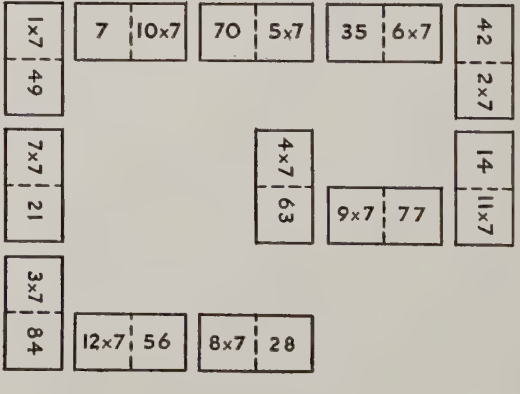
* * *

Tables Dominoes is a quieter game.

For the dominoes we want 12 small oblongs. We divide a postcard like this, and write figures in the squares :

7	10x7	14	11x7	21	7x7
35	6x7	42	2x7	49	1x7
63	4x7	70	5x7	77	9x7
28	8x7	56	12x7	84	3x7

We can use these 12 dominoes to play a game by ourselves. We mix the dominoes, and we put one out at random. At each end of it we put the matching dominoes. 42 matches with 6×7, 2×7 matches with 14, and so on. When all the dominoes are out, the end dominoes should match.



Here the end dominoes, 28 and 4×7, match.

For most games we want a double set of dominoes. The double set may be kept in a matchbox. When making a set for another table, it is advisable to follow the plan given for the 7's. For the table of 8's replace the multiples of 7 by the same multiples of 8. On the other half of the dominoes keep the first number the same; replace the 7, which comes second, by 8. The dominoes will then be :

$8 \mid 10 \times 8$	$16 \mid 11 \times 8$	$24 \mid 7 \times 8$
$32 \mid 8 \times 8$	$40 \mid 6 \times 8$	$48 \mid 2 \times 8$
$56 \mid 1 \times 8$	$64 \mid 12 \times 8$	$72 \mid 4 \times 8$
$80 \mid 5 \times 8$	$88 \mid 9 \times 8$	$96 \mid 3 \times 8$

Any other table can be made in the same way.

* * *

"Consecutive" is a word it is useful to know. Consecutive numbers are numbers that follow one another, without any gaps. 1, 2, 3, 4, 5 are consecutive numbers; so are 87, 88, 89, 90. But 13, 14, 18 are not consecutive, because there is a gap between 14 and 18.

We write six consecutive numbers, say :

47 48 49 50 51 52

Below we write them in reverse order :

52 51 50 49 48 47

We add the pairs, and in every case we find the total is 99. When we try other sets of consecutive numbers we find that it always works out like that: the pairs give equal totals.

Try this with any set of numbers you like. It will be a good test of addition. Then try it with sets of consecutive even numbers like this :

58 60 62 64 66
66 64 62 60 58

In each case the total is 124.

Or consecutive odd numbers :

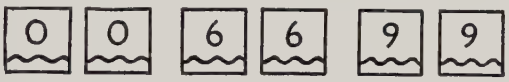
97 99 101 103 105
105 103 101 99 97

In each case the total is 202.

Can you see why these totals are always the same?

* * *

Here is the game of Twenties.



We want 42 cards similar to those used for Tables Snap—postcards cut in two. We number them in pairs—two cards numbered 0, two cards numbered 1, two cards numbered 2, and so on up to two cards numbered 20. Draw a wavy line along the bottom of each card to show which way up it should be held.

1. The cards are shuffled, and dealt out to several players. The first to play puts down a card, say 14. Any player who has 6, that is to make 14 up to 20, can put it down. The winner is the first to get the card down; he takes the pair of cards, and puts them on the table before him. The winner then plays another card from his hand.

The game ends when any player runs out of cards. The final winner is the one with most twenties.

2. These cards can also be used for Addition Snap. The pairs which snap are those which total 20. Thus : 17 snaps with 3, and not with the other 17; and 12 snaps only with 8.

TRY THESE—1

1. Write the multiples of 3 in a line, up to 45. Below them write the multiples of 7, up to 105. Add the multiples in pairs, 3 and 7, 6 and 14, and so on. Which table of multiples does this give?
2. In the same way write the multiples of 5 and 6, up to 70 and 84. Which table does the sum give?
3. Write the multiples of 5, from 175 to 220.
4. When we multiply a number by itself we square it. Thus the square of 8 is $8 \times 8 = 64$.

   Write the squares of numbers from 0 to 14. $0 \times 0 = ?$ $1 \times 1 = ?$ $2 \times 2 = ?$ And so on.
5. What are the squares of 15, 16, 19, 20?

(*Answers on page 141.*)

(2)

SUBTRACTING

Here is a Mystery Sum.

We write down any 3-figure number, say 683. Below we write the figures in reverse order, and subtract the smaller number from the greater.

```
  683      or      742
- 386            - 247
-----            -----
  297              495
```

We write these figures in reverse order, and add.

```
  297              495
+ 792            + 594
-----            -----
1,089            1,089
```

If the first number ends in 0, the reverse number must begin with 0 Thus :

```
  640
- 046
-----
  594
+ 495
-----
1,089
```

That is always the answer.

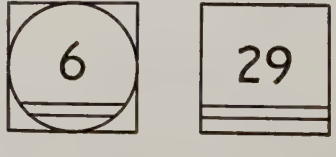
We can use this as a trick. We secretly write 1,089 at the bottom of a piece of paper, and fold it over, so that it cannot be seen. Then we get someone to work out the sum just above it. When he has finished, we turn over the fold and amaze him by showing that we knew his answer before he even chose his number !

* * *

For this Subtraction Game we need a lot of small squares of thin cardboard. We can cut 15 of them from each postcard.

On 18 of the squares we write the numbers 3 to 20. Round each number we draw a circle, and below the number a couple of lines. The lines show which way up the number is to be read, so that we do not mix 6 and 9, for example.

On 30 cards we write the numbers 1 to 30, without circles, but with the double lines below. There may be two sets like that. And that would need, altogether, 78 squares.



The cards are mixed, and shared out, face down, amongst several players. Each in turn turns up a card, and places it in the middle. Any player who sees two uncircled numbers on the table whose difference equals a circled number on the table, calls out. The first to call out takes the three cards, and places them on the table beside him. Thus, a player may see :

He calls out : "30 minus 16 is 14," and takes the cards.

The game ends when all the cards have been put out. The winner is the one who has taken most threes.

TRY THESE—2

1. (*a*) 360 — 127.
   (*b*) Subtract the answer from 360.
   (*c*) Add the two answers.
   Do this with other pairs of numbers.
2. Write a number consisting of 4 consecutive figures, say, 9876. Write the figures in reverse order, 6789, and subtract.
   Try other numbers of this kind, 8765, 7654, and so on.
3. Now try numbers consisting of 4 consecutive odd or 4 consecutive even numbers, say, 9753, 8642. Reverse, and subtract, as before.
4. Find by subtraction the number of years in 1,200 days. 1 year = 365 days.
5. Find the number of miles in 20,000 feet. 1 mile = 5,280 feet.

(*Answers on page 141.*)

(3)

MULTIPLYING

Multiplication is a sort of addition in which all the numbers we add are alike.

67	67
67	× 4
67	268
67	
268	

If we want to find 4 times 67, we can write 67 four times, and add up. We can add laboriously : 7 and 7, 14; and 7, 21; and 7, 28. Or we can say at once "Four 7's are 28." That is what we do when we multiply.

Addition may do very well with small numbers. But suppose we want to find 248 times a number, we should have to set it down 248 times. The sum would be a long, long task, with hundreds of chances of making mistakes. There is a much easier way.

1. Let us examine this sum.

	367
	×248
200 × 367 =	73,400
40 × 367 =	14,680
8 × 367 =	2,936
248 × 367 =	91,016

In the first line of multiplication we multiply by 200 (write two 0's and multiply by 2). In the second line we multiply by 40 (write 0, and multiply by 4). In the third line we multiply by 8. And then we add the three multiples of 367. Let us see what else we can do.

(*a*) We add the first and second multiples :
$73{,}400 + 14{,}680 = 88{,}080 = 240 \times 367.$

(*b*) We add the first and third multiples :
$73{,}400 + 2{,}936 = 76{,}336 = 208 \times 367.$

(*c*) We add the second and third multiples :
$14{,}680 + 2{,}936 = 17{,}616 = 48 \times 367.$

(*d*) We can subtract the second multiple from the first, the third from the first, or the third from the second.
$73{,}400 - 14{,}680 = 58{,}720 = 160 \times 367$
$73{,}400 - 2{,}936 = 70{,}464 = 192 \times 367$
$14{,}680 - 2{,}936 = 11{,}744 = 32 \times 367.$

That is quite a lot of information to extract from one multiplication.

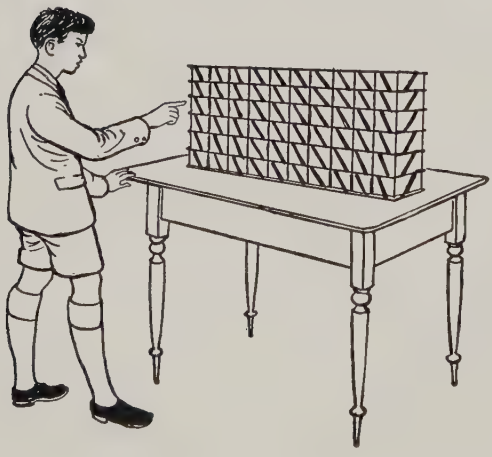
2. It is sometimes useful to know that we can subtract as well as add when we multiply. Look at 365×999. Of course we can multiply by 900; then by 90; then by 9. And add up.

But we may notice that 999 is 1 less than 1,000.

$$\begin{aligned} 365 \times 1{,}000 &= 365{,}000 \\ 365 \times \quad 1 &= \quad 365 \\ 365 \times \quad 999 &= 364{,}635 \end{aligned}$$

We subtract 365.

For 998 we might use 365×2 for the second line. And then subtract. For 997 we might subtract 365×3. And so on.



The hard way—this boy is counting six rows of boxes of chocolates, with ten boxes in each row, by adding them up one by one to make 60.

3. When we are learning the tables of multiples we can hardly help noticing that six 7's are 42, and seven 6's are 42.

$$6 \times 7 = 7 \times 6.$$

We may notice also :
$2 \times 3 = 3 \times 2 = 6.$
$3 \times 4 = 4 \times 3 = 12$, and so on.

When we come to the table of 12's we have already learnt all the multiples 1×12, 2×12, up to 11×12. The only new multiple we have to learn is :

$$12 \times 12 = 144.$$

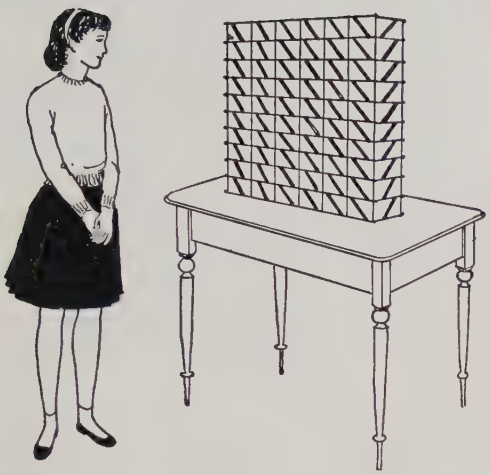
4. Is it always true that a first number multiplied by a second is equal to the second multiplied by the first? We can test various examples.

73	25
$\times$ 25	$\times$ 73
1,460	1,750
365	75
1,825	1,825

Every example we try works out like that. We may be sure that it is always true.

5. Sometimes when we multiply numbers we get odd results. Here are a few examples :

(*a*) $20{,}576 \times 6 = 123{,}456$



The easy way—this girl is multiplying ten rows of boxes of chocolates by six boxes in each row: $6 \times 10 = 60$.

(*b*) $76{,}923 \times 3 = 230{,}769$
$76{,}923 \times 4 = 307{,}692$
$76{,}923 \times 12 = 923{,}076$

We get the same figures in the same order, but beginning with different figures.

Now try multiplying 76,923 by 2, 5, 6, 7, and 11. Then by 9 and 10. And last, but not least, by 13.

(*c*) $13{,}717{,}421 \times 9 = 123{,}456{,}789$
$47{,}619 \times 5 = 238{,}095$
$47{,}619 \times 8 = 380{,}952$
$47{,}619 \times 11 = 523{,}809$
$47{,}619 \times 17 = 809{,}523$
$47{,}619 \times 20 = 952{,}380$

Now try multiplying 47,619 by 3, 6, 9, 12, 15, and 18. Then by 4, 10, 13, 16, and 19. And lastly by 7, 14, and 21.

* * *

Multiplying is used to change one unit of measurement to another.

1. (*a*) We may want to change shillings to pence. The answer is simple : A shilling is 12 pence, so we multiply by 12. If there are a few odd pence we add them on.
15s. $= 15 \times 12$d. $= 180$d.
8s. 4d. $= 8 \times 12 + 4 = 100$d.

(*b*) To change pounds to shillings we multiply by 20. (£1 = 20s.)
£27 $= 27 \times 20$s. $= 540$s.
£19 12s. $= 19 \times 20 + 12$
$= 392$s.

(*c*) To change pounds to half-crowns we multiply by 8. (£1 = 8 half-crowns.)
£38 $= 38 \times 8$ half-crowns
$= 304$ half-crowns.
£7 12s. 6d. $= 7 \times 8 + 5 = 61$ half-crowns. (12s. 6d. = 5 half-crowns.)

(*d*) To change pounds to florins we multiply by 10. (£1 = 10 florins.)

There are some tricks for working money sums quickly :

(*a*) How many threepences in a shilling? 4. So to change shillings to threepences we multiply by 4.
How many threepenny cakes could we buy for 18s. 9d.?
18s. 9d. $= 18 \times 4 + 3 = 75$

threepences. So the answer is 75 cakes.

(*b*) How many fourpences in a shilling? 3. So to change shillings to fourpences we multiply by 3.

(*c*) How many twopences in a shilling? 6. So to change shillings to twopences we multiply by 6.

(*d*) How many threehalfpences in a shilling? 8. So to change shillings to threehalfpences we multiply by 8.

A newsagent takes 37s. $7\frac{1}{2}$d. for newspapers costing $1\frac{1}{2}$d. each. How many has he sold? 37s. $7\frac{1}{2}$d. = 37 × 8 + 5 = 301 threehalfpences ($7\frac{1}{2}$d. = 5 threehalfpences.) He has sold 301 papers.

2. We can deal with weights in the same way:

(*a*) 1 lb. = 16 oz. To change pounds to ounces we multiply by 16, and add on any odd ounces.

(*b*) 1 cwt. = 8 stones. To change hundredweights to stones we multiply by 8.

1 cwt. = 112 lb. To change hundredweights to pounds we multiply by 112.

(*c*) 1 ton = 20 cwt. To change tons to hundredweights we multiply by 20.

1 ton = 2,240 lb. To change tons to pounds we multiply by 2,240. It is often more convenient to multiply by the number of tons.

2,240 lb.	
× $3\frac{1}{2}$	
6,720	$3\frac{1}{2}$ × 2,240 is the same as 2,240 × $3\frac{1}{2}$.
1,120	
7,840 lb.	$3\frac{1}{2}$ tons = 7,840 lb.

3. Now let us look at lengths.

(*a*) Feet to inches. Multiply by 12.

(*b*) Yards to feet. Multiply by 3.

Yards to inches. Multiply by 36.

(*c*) Miles to yards. Multiply by 1,760. It is usually easier to multiply 1,760 by the number of miles. Thus: $2\frac{1}{4}$ miles = 1,760 × $2\frac{1}{4}$ = 3,960 yd.

1,760 yd.	
× $2\frac{1}{4}$	
3,520	
440	
3,960 yd.	

4. Pints, quarts and gallons are very easy.

(*a*) Quarts to pints. Multiply by 2.

(*b*) Gallons to pints. Multiply by 8.

5. We may also need:

(*a*) Weeks to days. Multiply by 7.

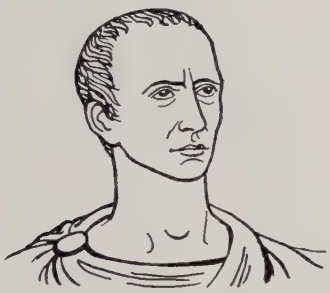
(*b*) Days to hours. Multiply by 24.

(*c*) Hours to minutes. Multiply by 60.

(*d*) Minutes to seconds. Multiply by 60.

(*e*) Years to days. Usually multiply by 365. But remember that every fourth year is a leap year, with 366 days, when February

has 29 days. Do you know how to find whether a year is a leap year? The test is whether the last 2 figures of the year can be exactly divided by 4 : 1956 was a leap year, 1957 was not. When a century comes, the test is whether the whole number can be divided exactly by four hundred : 1900 was not a leap year, but 2000 will be.



Julius Caesar, who introduced Leap Years.

TRY THESE—3

1. (*a*) 45×67. (*b*) 67×45.

Multiply other pairs of numbers in these ways.

2. (*a*) 568×99. (*b*) 745×999.

3. Look for oddities in the results of these multiplications :

(*a*) 37×27 (*b*) 259×39
(*c*) $153{,}846 \times 6\frac{1}{2}$ (*d*) $2{,}303 \times 429$
(*e*) $3{,}333 \times 37$ (*f*) 617×40
(*g*) $2{,}5641 \times 13$ (*h*) $25{,}641 \times 39$

4. How many $1\frac{1}{2}$d. cakes for 13s. 9d.?

5. A milkman delivers $48\frac{1}{2}$ gallons of milk.

(*a*) How many pints is that?
(*b*) At 6d. per pint what is the milk worth?
(*c*) If the milk were of better quality from a special herd, he could charge $9\frac{1}{2}$d. a pint. How much more would he take?

(*Answers on page 141.*)

(4)

DIVIDING

1. $135 \times 7 = 945$ $\quad 7)945 = 135$

We have multiplied 135 by 7, and then divided the answer by 7. And so we get back to the number we started with, 135.

We sometimes say that division is the opposite of multiplication : it undoes what multiplication does. We multiply by 7, and get a number 7 times as big. We divide by 7 and reduce it to a seventh of what it was. And, of course, a seventh of seven is one, and seven sevenths is also one.

2. $6)342 = 57$ We have divided 342 by 6, and the answer is 57. That tells us several things.

(*a*) A sixth of 342 is 57. If £342 were shared equally among 6 people, each would receive a sixth, that is £57.

If 342 ounces were made into 6 equal parcels, each parcel would contain a sixth of the weight, that is 57 ounces.

(*b*) In 342 there are 57 sixes. How many people could receive £6 each from £342? The answer is 57 people.

(*c*) Also 342 contains six 57's.

(*d*) $342 = 6 \times 57$. It is a multiple of both 6 and 57. And $342 \div 57 = 6$.

* * *

1. We sometimes write division sums with a bar between the numbers. The number we divide by is below the bar.

$$85 \div 5 = \frac{85}{5}$$

We read the bar as "divided by." In both forms we have "85 divided by 5," so the answer is 17.

2. Now look at this sum :

$$5\overline{)89}$$
$$17 + 4 \text{ remainder}$$

We have actually divided 85 by 5. The remaining 4 may also be divided by 5; it becomes $\frac{4}{5}$, that is, 4 divided by 5. We can write the sum :

$5\overline{)89}$ That is $\frac{1}{5}$ less than 18.
$17\frac{4}{5}$

3. When we are working sums about men or animals we do not want a fraction in the answer. $\frac{2}{3}$ of a boy, or of a live animal, does not mean anything. We leave the remainder as it is.

But many things can be divided. We might have $\frac{4}{5}$ of an inch, or $\frac{4}{5}$ of a pound of butter, for example. We need to use our common sense in arithmetic, as in everything else.

	s. d.	s. d.
1.	5)28 4	5 8
	5 8	× 5
		28 4

We have divided 28s. 4d. by 5. 5 into 28, 5 and 3 over. The 3 over we change to pence, and add on the odd 4d. We now say, "5 into 40, 8."

We put 28s. 4d. into 5 equal parts; each part is 5s. 8d. A fifth of 28s. 4d. is 5s. 8d. 5s. 8d. is contained 5 times in 28s. 4d.

We multiply 5s. 8d. by 5 and so get the original amount, 28s. 4d.

2. $7\overline{)19}$s. 0d.
2s. $8\frac{1}{2}$d. + $\frac{1}{2}$d. remainder.

In this example the 4d. over is changed to 8 halfpennies. 7 into 8, 1 and 1 over; that is 1 halfpenny, so we write $\frac{1}{2}$d. The $\frac{1}{2}$d. that is still left over, we can do nothing with; we leave it as $\frac{1}{2}$d. remainder.

We can now say that a seventh of 19s. is 2s. $8\frac{1}{2}$d., with $\frac{1}{2}$d. remainder. 2s. $8\frac{1}{2}$d. is exactly a seventh of 18s. $11\frac{1}{2}$d. 2s. $8\frac{1}{2}$d. is contained 7 times in 19s., and there is also an additional $\frac{1}{2}$d.

When we multiply 2s. $8\frac{1}{2}$d. by 7 the answer is 18s. $11\frac{1}{2}$d., so we still need the $\frac{1}{2}$d. over to make up to 19s.

* * *

1. We can divide weights and measures in the same way that we have divided money.

	lb. oz.	lb. oz.
	12)53 4	4 7
	4 7	× 12
		53 4

We divide 53 lb. 4 oz. by 12. The

5 lb. over we change to ounces, and add on the odd 4 oz. This is $5 \times 16 + 4 = 84$ oz. 12 into 84, 7. We multiply 4 lb. 7 oz. by 12, and so we go back to the weight we started with, 53 lb. 4 oz.

A twelfth of 53 lb. 4 oz. is 4 lb. 7 oz. 4 lb. 7 oz. is contained exactly 12 times in 53 lb. 4 oz.

2. 4 cwt. of a powder is made up into packets of $3\frac{1}{2}$ lb. How many packets can be made?

This looks like an awkward division by $3\frac{1}{2}$. But we can avoid that by working in half-pounds.

4 cwt. = 448 lb. = 896 half-lb.

$3\frac{1}{2}$ lb. = 7 half-lb.

Then : $896 \div 7 = 128$.

We should get 128 packets. If we didn't, it would mean we hadn't weighed them accurately enough.

We have a piece of ribbon $4\frac{1}{2}$ yards long and we want to cut it into lengths of 11 inches. How many do we get? We can find the answer by arithmetic, without touching a pair of scissors.

36 in.
$\times 4\frac{1}{2}$
144
18
162 in.

That sum is awkward as it is. But if we change the yards to inches ($36 \times 4\frac{1}{2}$) we merely have to find how many 11's in 162.

11)162 in.
14 + 8 in. over.

We should get 14 lengths, and 8 inches would be left over.

* * *

1. We have seen how shillings can be changed to pence : multiply by 12. For the opposite change, pence to shillings, we divide by 12.

12)570d.
47s. 6d.

570d. is 47s. 6d., or £2 7s. 6d.

2. To change shillings to pounds we divide by 20.

20)314s.
£15 14s.

314s. is £15 14s. In dividing by 20 we mark off the end figures. We then divide 31 by 2. There is 1 over, that is one 10. We write 1 and bring down the 4 after it.

3. How much is paid for 789 twopenny tickets?

6 twopences in 1s. Divide by 6.

6)789 twopences
131s. 6d. = £6 11s. 6d.

The 3 over when we divide by 6 is of course 3 twopences, so we write 6d.

4. How much is paid for 581 $3\frac{1}{2}$d. tickets?

We cannot easily change straight to shillings, so we change first to pence, multiplying by $3\frac{1}{2}$, and then dividing by 12 and 20.

$$\begin{array}{r} 581 \\ \times\ 3\frac{1}{2} \\ \hline 1{,}743 \\ 290\frac{1}{2} \\ \hline 2{,}033\frac{1}{2}\text{d.} \end{array}$$

$$12\overline{)2{,}033\frac{1}{2}\text{d.}}$$

$$169\text{s. } 5\tfrac{1}{2}\text{d.} = £8\ 9\text{s. } 5\tfrac{1}{2}\text{d.}$$

But here is a quicker way of doing the same sum :

580 at 3d. $= \frac{580}{4}$ shillings
$= 145\text{s.} =$ £7 5 0
580 at $\frac{1}{2}$d. $= \frac{580}{2}$ pence
$= 290\text{d.} =$ £1 4 2
1 at $3\frac{1}{2}$d. $=$ $3\frac{1}{2}$
£8 9 $5\frac{1}{2}$

Arithmetic is never as hard as it looked before we thought of the easy way of doing it.

* * *

1. To change ounces to pounds we have to divide by 16.

$$16\overline{)1000\text{ oz.}}\quad 62\text{ lb.}$$

96
40
32
8 oz.

To make up 1,000 ounce packets we should need 62 lb. 8 oz.

2. Changing cwts. to tons is like changing shillings to pounds. We divide by 20.

$$2{,}0\overline{)37{,}5\text{ cwt.}}\quad 18\text{ tons }15\text{ cwt.}$$

375 cwt. is 18 tons 15 cwt.

* * *

1. Sometimes we put things together, and share them out evenly. The even share is called the average.

Suppose we have four bags of marbles, holding 4, 5, 6 and 9 each. We put them all together :

$$4 + 5 + 6 + 9 = 24$$

And share them equally : $4\overline{)24}\quad 6$

6 is the average of 4, 5, 6 and 9. We could readily change the numbers to equalize them. We take 3 from 9, and add 2 to 4, and 1 to 5. Each bag then has the average number, 6.

2. Batting averages are the average numbers of runs per innings made by cricketers. We add together all the runs scored by a cricketer, and divide by the number of innings. If a cricketer is not out we add the runs he makes but we do not add the not-out innings to the total of innings.

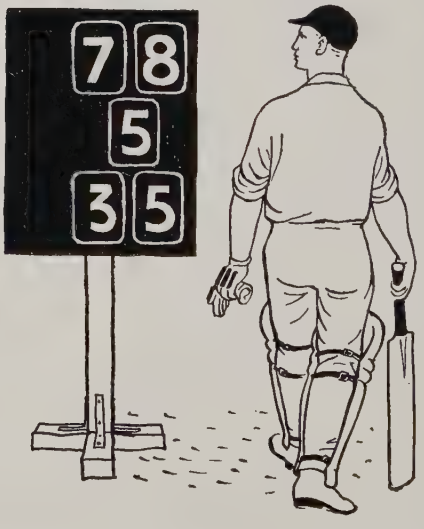
A cricketer's scores in his first six innings are : 17, 3, 28 not out, 0, 35, 43 not out.

Add the scores : $17 + 3 + 28 + 0 + 35 + 43 = 126$.

Number of completed innings : 4.

Average score per innings :

$$126 \div 4 = 31\tfrac{1}{2}.$$



This batsman has scored 35 runs. The total for his side is 78 runs for the loss of five wickets.

3. Bowling averages are rather different. A bowling average is the average number of runs scored off a bowler, for every wicket taken by the bowler.

The following runs are scored off a bowler in his first six matches : 53, 28, 47, 61, 24, 17.

Wickets taken by him in each match are : 5, 3, 4, 5, 2, 3.

Add the scores : $53 + 28 + 47 + 61 + 24 + 17 = 230$.

Total wickets taken : $5 + 3 + 4 + 5 + 2 + 3 = 22$.

Average score per wicket :

$$230 \div 22 = 10\tfrac{10}{22}$$

and that is very nearly $10\frac{1}{2}$.

TRY THESE—4

1. What is the value of 340 tickets :
   (*a*) At $1\frac{1}{2}$d. each ?
   (*b*) At 2d. each ?
   (*c*) At $3\frac{1}{2}$d. each ?
2. How many lengths of 15 inches can be cut from a roll of $7\frac{1}{2}$ yards ?
3. A batsman scores in consecutive innings : 35, 6, 19 not out, 42 not out, 12, 15, 18. What is his average ?
4. How would you divide 310 pupils into 8 forms, so as to have the forms as nearly equal as possible ?
5. £100 is shared among 28 people. Some receive £3 and the others £4. How many can receive £4 ?

(*Answers on page 142.*)

(5)

FACTORS

1. A factor of a number is another number that divides into it exactly. 3 divides into 15 ; so does 5. So 3 and 5 are both factors of 15. When we show the factors of 15, we write :

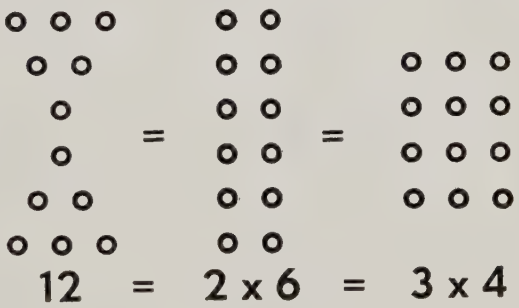
$$15 = 3 \times 5.$$

2. Which numbers are factors of 24 ? We try the numbers 2, 3, 4, 5, and so on, up to 12. 12 is half of 24, so there is no factor of 24 that is more than 12. If we try to divide 24 by a number greater than 12, we soon see why : there must be a remainder.

Some numbers we can discard at once : 5—certainly not, 7—no, 9—no, 11—no. But 2, 3, 4, 6, 8, 12 are all factors of 24. We notice that we can arrange the factors in pairs that give 24 when multiplied.

$$24 = 2 \times 12 = 3 \times 8 = 4 \times 6.$$

3. Let us look at the factors of 36. No factor can be more than 18, which is half of 36. We see that the factors are 2, 3, 4, 6, 9, 12, 18. And :



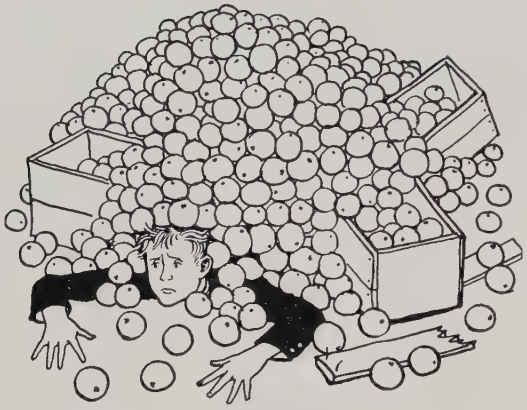
$$36 = 2 \times 18 = 3 \times 12 = 4 \times 9 = 6 \times 6.$$

The 6 pairs with itself.

4. Look at 64. No factor is greater than 32. And we should quickly see that the factors are : 2, 4, 8, 16, 32.

$$64 = 2 \times 32 = 4 \times 16 = 8 \times 8.$$

Each factor is twice the one before



The sad plight of a boy with ten boxes, who tried to put two oranges in the first box, twice as many in the second, twice as many as that in the third, and so on.

it. The reason is that :

$$64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

If we start with 2, and go on multiplying by 2, we get :

2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024.

Each of those numbers has all the numbers before it as factors.

5. We write 2 ten times and multiply them together to reach 1,024. Let us see how high we get by writing 3 ten times and multiplying them together :

3, 9, 27, 81, 243, 729, 2,187, 6,561, 19,683, 59,049.

Again, each of those numbers has all the numbers before it as factors.

6. The multiples of 9 are the numbers which have 9 as a factor. Here are the smaller multiples : 9, 18, 27, 36, 45, 63, 72, 81, 90, 99, 108, 117.

Here is a peculiar thing : when we add the figures of these numbers the total is always 9.

$9 = 1 + 8 = 2 + 7 = 3 + 6 = 4 + 5 = 6 + 3 = 7 + 2 = 8 + 1 = 9 + 0 =$ ($9 + 9 = 18$, and $1 + 8 = 9$) $=$

$$1 + 0 + 8 = 1 + 1 + 7.$$

When the figures of a number add up to 9 we know that 9 is a factor. We write several numbers at random :

367, 1,854, 789, 1,053.

$3 + 6 + 7 = 16$, and $1 + 6 = 7$. 9 is not a factor of 367.

$1 + 8 + 5 + 4 = 18$, and $1 + 8 = 9$. 9 is a factor of 1,854.

$$1{,}854 = 9 \times 206.$$

$7 + 8 + 9 = 24$, and $2 + 4 = 6$. 9 is not a factor of 789.

$1 + 0 + 5 + 3 = 9$. 9 is a factor of 1,053. $1{,}053 = 9 \times 117$.

7. There is a similar rule for 3. If the figures add up to a multiple of 3 then 3 is a factor.

456. $4 + 5 + 6 = 15$. 3 is a factor, and $456 = 3 \times 152$.

176. $1 + 7 + 6 = 14$. 3 is not a factor of 176.

294. $2 + 9 + 4 = 15$. 3 is a factor, and $294 = 3 \times 98$.

8. Let us try this method on 729.

$7 + 2 + 9 = 18$, and $1 + 8 = 9$. $729 = 9 \times 81$.

But $1 + 8 = 9$, so $81 = 9 \times 9$.

Therefore $729 = 9 \times 9 \times 9$.

9. There is an interesting way of finding whether 11 is a factor. We add the figures in two sets : those in odd places, and those in even places.

58,267

The figures in odd places—1st, 3rd, 5th.

$$5 + 2 + 7 = 14.$$

The figures in even places—2nd, 4th.

$$8 + 6 = 14.$$

If the two totals are equal, or differ by a multiple of 11, then the number has 11 for a factor.

In 58,267 the totals are equal.

$$58{,}267 = 11 \times 5{,}297.$$

Look at 68,948.

$6 + 9 + 8 = 23$. $8 + 4 = 12$.

The difference is $23 - 12 = 11$. So 11 is a factor.

$$68{,}948 = 11 \times 6{,}268.$$

It is easy to discover whether any number has a factor of 2, 4 or 5.

If the last figure is even, it has a factor of 2 :—12, 48, 796, but not 17, 49, 697.

If the last 2 figures can be divided exactly by 4, it has a factor of 4 :—248, 716, 952, but not 259, 618, 842.

If the last figure is 5 or 0 it has a factor of 5 :—25, 240, 475.

TRY THESE—5

1. What are the factors of 15, 21, 25, 35, 51 ?
2. Which numbers are factors of the following ? : (*a*) 30, (*b*) 45, (*c*) 48, (*d*) 60, (*e*) 128.
3. Discover by a quick check, without doing the full division, whether 3, 4, 9 or 11 are factors of (*a*) 66,132, (*b*) 21,123, (*c*) 33,429, (*d*) 525,676.
4. Find common multiples of 3 and 7 : the least, and the next four.
5. Find the least common multiple for (*a*) 3 and 4, (*b*) 3, 4 and 6, (*c*) 3, 4, 6 and 12, (*d*) 2, 4, 8 and 16, (*e*) 3, 9 and 27, (*f*) 5, 25 and 125, (*g*) 4, 9, 12 and 18.

(*Answers on page 142.*)

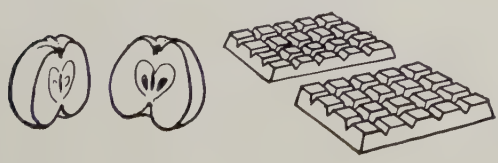
(6)

FRACTIONS

1. We cut an apple in two, and if the parts are equal we call them halves. And we write $\frac{1}{2}$ for a half. $\frac{1}{2}$d. is half a penny exactly. $\frac{1}{2}$ lb. of tea is carefully weighed so that two $\frac{1}{2}$ lb. would make a pound.

We do sometimes use the word "half" in a careless sort of way. A half-holiday is not always exactly half of a working day. We say a loaf is half-baked, when probably it is a lot more than half.

But the halves we use in arithmetic are real halves. Two halves make up the whole exactly. $\frac{1}{2} + \frac{1}{2} = 1$.

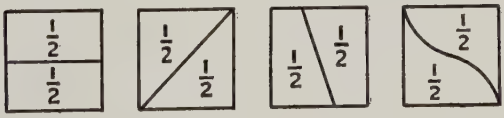


2. We cut a lump of clay in two. If the parts are equal in size we have two halves of the lump. We may mould the halves to various shapes, and they still remain halves. It is the quantity that counts, not the shape.

Half of a shilling is sixpence. We may have the sixpence as 1 coin, as 2, as 6, or as 12. It is the value that counts.

$\frac{1}{2}$ lb. is 8 oz. The 8 oz. remains $\frac{1}{2}$ lb. whether it is 8 oz. of tea, or sugar, or whatever it is.

Here are four squares, each divided into halves. The shapes of the halves vary, but not their size.



3. When we say 2 halves make 1 whole, we mean two halves of the same thing, or of equal things.

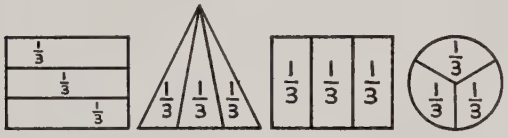
£$\frac{1}{2}$ is 10s.; $\frac{1}{2}$d. is only a halfpenny.

$\frac{1}{2}$ ton is 10 cwt., enough to make 10 sacks of coal.

$\frac{1}{2}$ lb. of tea is put up in a small paper bag.

* * *

1. We cut something into 3 equal parts, and we call them thirds. We write $\frac{1}{3}$ for a third. We call the 3 the denominator, because it names the fraction. 2 is the denominator of $\frac{1}{2}$.



Here are some shapes divided into thirds. In each example 3 thirds, equal in size, make up the whole.

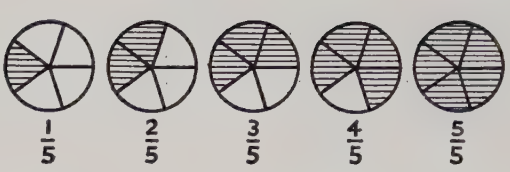
2. With 4 equal parts we get fourths or quarters. We write $\frac{1}{4}$ for fourth or quarter. 4 is the denominator. Whatever the shape or size of the object, 4 fourths always make up the whole.

With 5 equal parts we get fifths, and write $\frac{1}{5}$ for a fifth. 5 fifths make up the whole.

We can go on to a sixth—$\frac{1}{6}$, a seventh—$\frac{1}{7}$, an eighth—$\frac{1}{8}$, and so on.

3. We divide a thing into 3 thirds, and we take two of them. That is 2-thirds. We write it $\frac{2}{3}$. 2 is the numerator, or numberer. It tells how many parts we take. We can hardly help noticing that 3-thirds is the whole. $\frac{3}{3} = 1$.

We divide a thing into 4 quarters, and we take three of them. That is 3-quarters. We write it $\frac{3}{4}$. 3 is the numerator. It tells how many quarters.

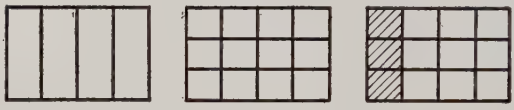


4. Here are 5 equal circles, each divided into fifths. They are shaded to show : $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{4}{5}$, $\frac{5}{5}$.

And we see that $\frac{5}{5} = 1$.

5. Let us write a fraction at random, say $\frac{4}{7}$. What does $\frac{4}{7}$ mean? The denominator names the parts as sevenths; there are 7 equal parts. The numerator says we take 4 of them—4-sevenths.

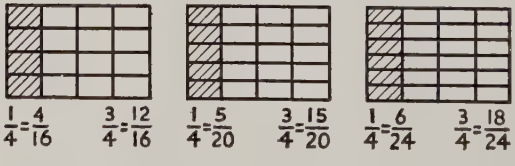
* * *



1. Here are 3 equal oblongs. The first is divided into quarters. In the second the crosslines divide the oblong into 3 equal parts. We have multiplied the number of parts by 3. $3 \times 4 = 12$; there are now 12 equal parts and each is $\frac{1}{12}$. In the third oblong $\frac{1}{4}$ is shaded, to show :

$$\frac{1}{4} = \frac{3}{12}, \quad \frac{3}{4} = \frac{9}{12}.$$

We have multiplied numerator and denominator by 3 without changing the values of the fractions.

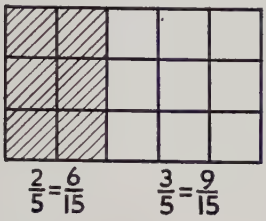


2. (*a*) We could divide the oblong by cross lines into 4, 5, 6, or any number of equal parts.

And so we can multiply numerator and denominator by any number we like, without

changing the value of the fraction.

(*b*) And we can have any fraction we like, as well as the $\frac{1}{4}$ and $\frac{3}{4}$ we began with.



This divided oblong, for example, shows that :

$$\frac{2}{5} = \frac{6}{15}; \frac{3}{5} = \frac{9}{15}.$$

It is always true that we can multiply the numerator and denominator of a fraction by any number, without changing its value. But it must be the same number for both.

* * *

1. We have seen that :

$$\frac{3}{4} = \frac{9}{12}.$$

We can equally well write that :

$$\frac{9}{12} = \frac{3}{4}.$$

So we can divide numerator and denominator by 3 without changing the value of the fraction.

That is true for all the pairs of fractions :

$\frac{1}{4} = \frac{4}{16}$ and $\frac{4}{16} = \frac{1}{4}$

$\frac{3}{5} = \frac{9}{15}$ and $\frac{9}{15} = \frac{3}{5}$, and so on.

We can always divide numerator and denominator by the same number without changing the value of the fraction. This is called to *cancel.*

2. We have to be careful how we select a number to divide by. It ought to be a factor of both numerator and denominator, so that it may divide exactly into both.

Look at $\frac{24}{36}$. 6 is a common factor of 24 and 36. So :

$$\frac{24}{36} = \frac{4}{6} = \frac{2}{3}.$$

But 12 is also a common factor. So :

$$\frac{24}{36} = \frac{2}{3}.$$

Similarly $\frac{1625}{625}$. Divide by 5. So :

$$\frac{1625}{625} = \frac{25}{125} = \frac{5}{25} = \frac{1}{5}.$$

Or $\frac{105}{168}$. Divide by 3. So :

$$\frac{105}{168} = \frac{35}{56} = \frac{5}{8}.$$

Can we reduce $\frac{69}{92}$ to a simpler form? No common factor may be obvious to most people. But $69 = 3 \times 23$. If there is a common factor it must be 3 or 23. We now see that $92 = 4 \times 23$. So $\frac{69}{92} = \frac{3}{4}$.

* * *

1. We have noticed that :

$$\frac{3}{3} = \frac{4}{4} = \frac{5}{5} = \frac{6}{6} = \frac{7}{7} = 1.$$

When we cancel we get $\frac{1}{1}$ in each case, and "one oneth" is of course 1.

$\frac{7}{7} = 1$. So $\frac{14}{7} = 2$, $\frac{21}{7} = 3$, $\frac{28}{7} = 4$, and so on.

2. $\frac{30}{7} = ?$ $\frac{28}{7} = 4$, so $\frac{30}{7} = 4\frac{2}{7}$. We can always read the bar as "divided by," and $30 \div 7 = 4\frac{2}{7}$.

Similarly $\frac{90}{12} = 7\frac{6}{12} = 7\frac{1}{2}$. Or we could first divide by 6. $\frac{90}{12} = \frac{15}{2} = 7\frac{1}{2}$.

It is convenient to know these two names. An "improper fraction" is a fraction whose numerator is greater than its denominator. A "mixed number" is partly a whole number, and partly a fraction.

We can change an improper fraction into a mixed number by dividing. Thus :

$\frac{57}{11} = 57 \div 11 = 5\frac{2}{11}$.

$\frac{80}{7} = 80 \div 7 = 11\frac{3}{7}$.

3. We sometimes want to turn a mixed number into an improper fraction. We change the whole number and add on the fraction.

$5\frac{3}{4} = \frac{20}{4} + \frac{3}{4} = \frac{23}{4}$.
$7\frac{5}{6} = \frac{42}{6} + \frac{5}{6} = \frac{47}{6}$.
$33\frac{1}{3} = \frac{100}{3}$. (So $33\frac{1}{3}$ is $\frac{1}{3}$ of 100.)

* * *

1. It is quite easy to add fractions when they are of the same kind, that is with the same denominator.
$\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$; $\frac{1}{6} + \frac{5}{6} = \frac{6}{6} = 1$
$\frac{1}{7} + \frac{2}{7} + \frac{3}{7} = \frac{6}{7}$
$\frac{1}{8} + \frac{3}{8} + \frac{5}{8} = \frac{9}{8} = 1\frac{1}{8}$.

2. When the fractions are of different kinds it is not quite so easy. The remedy is to change them so that they are of the same kind.

Take for example $\frac{3}{5} + \frac{4}{7}$.

We want a denominator into which both 5 and 7 divide. That is $5 \times 7 = 35$.

$\frac{3}{5} = \frac{21}{35}$ (Multiply by 7.)
$\frac{4}{7} = \frac{20}{35}$ (Multiply by 5.)
$\frac{3}{5} + \frac{4}{7} = \frac{21}{35} + \frac{20}{35}$
$= \frac{41}{35}$
$= 1\frac{6}{35}$.

3. Let us take another example:
$\frac{3}{4} + \frac{5}{8} + \frac{11}{16}$.
All the denominators divide into 16.
$\frac{3}{4} = \frac{12}{16}$; $\frac{5}{8} = \frac{10}{16}$
$\frac{3}{4} + \frac{5}{8} + \frac{11}{16} = \frac{12}{16} + \frac{10}{16} + \frac{11}{16}$
$= \frac{33}{16}$
$= 2\frac{1}{16}$.

4. When we are adding mixed numbers we begin by adding the whole numbers, and then adding together the fractions separately. Thus:
$3\frac{2}{3} + \frac{5}{6} + 4\frac{7}{12}$ (3, 6, and 12 all divide into 12)
$= 7\frac{8}{12} + \frac{10}{12} + \frac{7}{12}$
$= 7\frac{25}{12}$ $(\frac{25}{12} = 2\frac{1}{12})$
$= 9\frac{1}{12}$.

5. (*a*) Subtraction is not greatly different from addition. Thus:
$\frac{3}{4} - \frac{2}{5}$ (4 and 5 divide into 20)
$= \frac{15}{20} - \frac{8}{20} = \frac{7}{20}$.
Similarly $\frac{7}{8} - \frac{1}{2} - \frac{1}{3}$ (8, 2, and 3 all divide into 24)
$= \frac{21}{24} - \frac{12}{24} - \frac{8}{24} = \frac{1}{24}$.

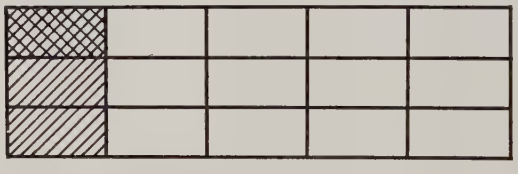
(*b*) When there are whole numbers we subtract them first.
$12\frac{3}{4} - 6\frac{1}{3} = 6$ and $\frac{3}{4} - \frac{1}{3} = \frac{5}{12}$.

(*c*) There is sometimes a little awkwardness, when the fraction to be subtracted is greater than the first fraction.
$7\frac{1}{6} - 3\frac{5}{9}$ (6 and 9 both divide into 18).
$= 4\frac{3}{18} - \frac{10}{18}$.
(We cannot take $\frac{10}{18}$ from $\frac{3}{18}$, but we can change one of the 4 whole ones into 18ths.)
$= 3\frac{21}{18} - \frac{10}{18} = 3\frac{11}{18}$.

* * *

1. (*a*) When we multiply a quantity by $\frac{3}{4}$ we are finding $\frac{3}{4}$ of it. Thus 1 lb. $\times \frac{3}{4} = 12$ oz.

Let us look at a simple example: $\frac{1}{3}$ of $\frac{1}{5}$, or $\frac{1}{3} \times \frac{1}{5}$.



In the diagram $\frac{1}{5}$ is shaded, and $\frac{1}{3}$ of $\frac{1}{5}$ is cross-shaded. $\frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$. That is, we multiply the denominators.
$\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$; $\frac{1}{7} \times \frac{1}{8} = \frac{1}{56}$, and so on.

(*b*) $\frac{1}{3} \times \frac{4}{5}$ is evidently 4 times as much as $\frac{1}{3} \times \frac{1}{5}$. That is $\frac{4}{15}$.
$\frac{2}{3} \times \frac{4}{5}$ is twice as much as $\frac{4}{15}$. That is $\frac{8}{15}$.
So, $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$.

To get the numerator of the answer we multiply the two numerators.

Thus, $\frac{3}{4} \times \frac{4}{9} = \frac{12}{36} = \frac{1}{3}$.

2. Mixed numbers seem to introduce a difficulty, but it is easy to get over it. We simply change the mixed numbers into improper fractions.

$3\frac{1}{3} \times 1\frac{4}{5} = \frac{10}{3} \times \frac{9}{5}$ (We divide by, or cancel, 5 and 3.)

$= \frac{6}{1}$, or 6.

$2\frac{1}{4} \times 2\frac{1}{3} \times \frac{2}{7} = \frac{9}{4} \times \frac{7}{3} \times \frac{2}{7}$ (Cancel 3, 2, and 7.)

$= \frac{3}{2}$, or $1\frac{1}{2}$.

3. Multiplying and dividing by the same number is equivalent to multiplying by 1. $3 \times 3 \div 3 = 3 \times 1$. Also $\frac{3}{7} \times \frac{3}{7} \div \frac{3}{7} = \frac{3}{7} \times 1$.

So $\frac{3}{7} \div \frac{3}{7} = 1$ (Of course it does !)

And $\frac{3}{7} \times \frac{7}{3} = 1$ (Cancel 7 and 3.)

That is, dividing by $\frac{3}{7}$ is the same as multiplying by $\frac{7}{3}$. And we can have any other fraction instead of $\frac{3}{7}$. So we have the rule :

To divide by a fraction, turn the divisor upside down and multiply. Here are examples :

(*a*) $\frac{3}{5} \div \frac{7}{10} = \frac{3}{5} \times \frac{10}{7}$ (Cancel 5.)

$= \frac{6}{7}$.

(*b*) $\frac{2}{9} \times \frac{6}{7} \div \frac{4}{15} = \frac{2}{9} \times \frac{6}{7} \times \frac{15}{4}$ (Cancel 3, 3, 2, and 2.)

$= \frac{5}{7}$.

(*c*) $3\frac{1}{2} \times \frac{5}{14} \div 6\frac{1}{4} = \frac{7}{2} \times \frac{5}{14} \times \frac{4}{25}$ (Cancel 7, 5, 2, and 2.)

$= \frac{1}{5}$.

* * *

1. (*a*) What is $£\frac{5}{6}$? Begin with $\frac{1}{6}$. 20s. $\div$ 6 = 3s. 4d.

$£\frac{5}{6}$ = 3s. 4d. $\times$ 5 = 16s. 8d.

(*b*) What is $\frac{3}{4}$ cwt. in lb.? First $\frac{1}{4}$. 112 $\div$ 4 = 28 lb.

$\frac{3}{4}$ cwt. = 28 lb. $\times$ 3 = 84 lb.

(*c*) What is $\frac{4}{5}$ year in days. $\frac{1}{5}$ year = 365 days $\div$ 5 = 73 days.

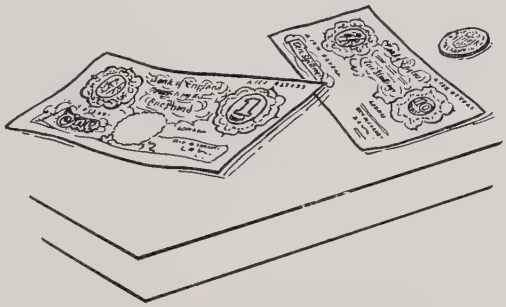
$\frac{4}{5}$ year = 73 days $\times$ 4 = 292 days.

2. Here is a sort of puzzle, the other way round :

$\frac{5}{6}$ of a sum of money is 16s. 8d. How much is it?

5-sixths is 16s. 8d. 1-sixth is 16s 8d. $\div$ 5 = 3s. 4d.

3s. 4d. is $\frac{1}{6}$, so $\frac{6}{6}$ = 3s. 4d. $\times$ 6 = £1.



10 shillings = $£\frac{1}{2}$.
Half a crown = $\frac{1}{4}$ of 10 shillings or $£\frac{1}{8}$.

TRY THESE---6

1. What are halves of the following : (*a*) £1? (*b*) 5s.? (*c*) 3s. 6d.? (*d*) 3 lb.? (*e*) 1 ton?

2. (*a*) $£\frac{1}{3}$ = ? (*b*) $£\frac{2}{3}$ = ? (*c*) $£\frac{1}{6}$ = ? (*d*) $£\frac{5}{6}$ = ?

3. Divide numerator and denominator by any common factors they have : (*a*) $\frac{10}{20}$. (*b*) $\frac{48}{96}$. (*c*) $\frac{18}{27}$. (*d*) $\frac{75}{100}$. (*e*) $\frac{16}{40}$. (*f*) $\frac{56}{63}$. (*g*) $\frac{14}{49}$. (*h*) $\frac{125}{1000}$.

4. (*a*) $\frac{3}{4} + \frac{5}{6}$. (*b*) $\frac{1}{6} + \frac{1}{2} + \frac{2}{3}$. (*c*) $\frac{1}{2} + \frac{4}{5} + \frac{7}{10}$. (*d*) $3\frac{2}{3} + 1\frac{1}{2} + \frac{7}{12}$. (*e*) $\frac{5}{9} + 2\frac{3}{4} + 5\frac{5}{6}$.

5. (*a*) $\frac{3}{4} - \frac{1}{6}$. (*b*) $\frac{4}{5} - \frac{1}{2}$. (*c*) $\frac{7}{8} - \frac{5}{6}$. (*d*) $3\frac{2}{3} - 1\frac{1}{6}$. (*e*) $4\frac{2}{5} - 3\frac{7}{10}$. (*f*) $10 - 8\frac{2}{3}$. (*g*) $9\frac{1}{6} - 4\frac{3}{4}$.

6. (*a*) $\frac{4}{5} \times \frac{2}{7}$. (*b*) $\frac{4}{9} \times \frac{3}{8}$. (*c*) $\frac{2}{3} \times \frac{5}{6} \times \frac{9}{16}$. (*d*) $1\frac{1}{2} \times \frac{4}{9}$. (*e*) $3\frac{1}{3} \times 1\frac{1}{3} \times 1\frac{4}{5}$. (*f*) $2\frac{1}{2} \times 1\frac{1}{6} \times \frac{4}{7}$. (*g*) $4\frac{3}{4} \times \frac{3}{10} \times 1\frac{2}{3}$.

7. What is the rule for division of fractions?

8. (*a*) $\frac{4}{9} \div \frac{2}{3}$. (*b*) $\frac{4}{5} \div \frac{3}{10}$. (*c*) $\frac{9}{14} \div \frac{1}{7}$. (*d*) $3\frac{1}{3} \div \frac{5}{9}$. (*e*) $6\frac{2}{3} \div 3\frac{1}{2}$. (*f*) $4\frac{1}{2} \div \frac{3}{8}$. (*g*) $7\frac{1}{2} \div 1\frac{1}{4}$. (*h*) $\frac{1}{2} \times 3\frac{1}{2} \div 1\frac{1}{7}$.

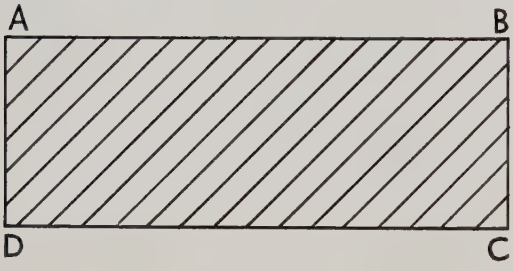
9. Fill in the question marks in these sums: (*a*) $\frac{1}{4} = \frac{?}{12}$, $\frac{3}{4} = \frac{?}{12}$. (*b*) $\frac{1}{6} = \frac{?}{18}$, $\frac{5}{6} = \frac{?}{18}$. (*c*) $\frac{1}{8} = \frac{?}{24}$, $\frac{3}{8} = \frac{?}{24}$, $\frac{5}{8} = \frac{?}{24}$, $\frac{7}{8} = \frac{?}{24}$.

(*Answers on page 142.*)

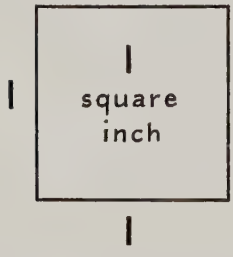
(7)

AREAS

1. The sides of this oblong are the lines labelled AB, BC, CD, and DA. These lines are just a frame for the oblong.

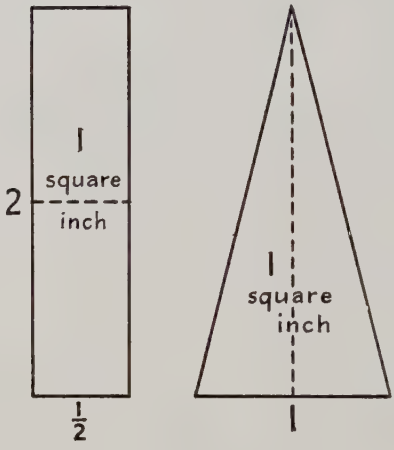


The area is the whole surface that is shaded. We hold a ball, or an apple, in our hands. Its area is all the outside surface we can feel with the hands.



2. Here is one unit we use for measuring areas. It is the area of a square with one inch sides. We call this area a square inch.

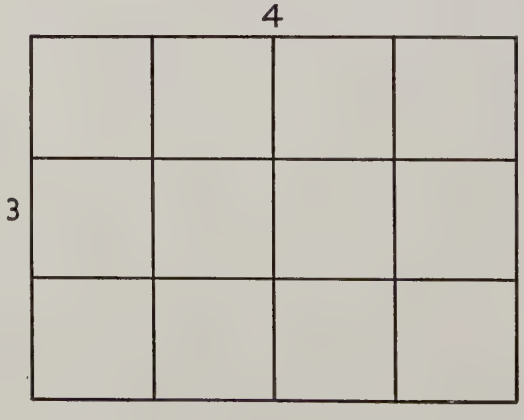
It is the size that matters, not the shape. We could cut up the square and arrange the parts to form different shapes. But the area would still be the same; it has been changed in shape



but the size has not altered at all.

3. There are easy ways of calculating the areas of certain shapes.

We draw an oblong 3 in. by 4 in., divide the sides into inches, and join across. This divides the oblong into inch-squares. There are 3 rows of



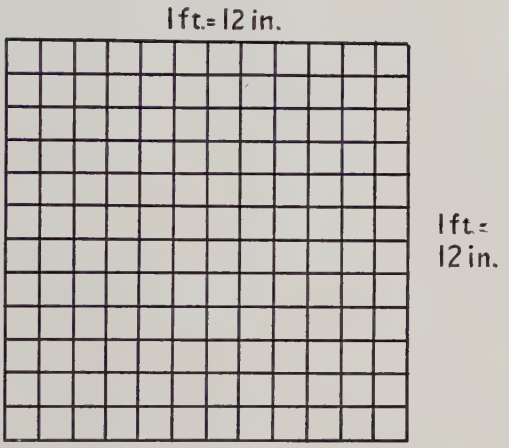
4 squares, and that is 12 of them; so the area is 12 square inches. We write :

3 in. × 4 in. = 12 square in.

That is not quite the usual idea of multiplying, but we can always find the area of an oblong by multiplying the lengths of the sides.

4. (*a*) When the sides are equal we have a square. The area of a 5-inch square is :

5 in. × 5 in. = 25 square in.



(*b*) A 12-inch square has an area of 1 square ft. So :

1 square ft. = 12 in. × 12 in.
= 144 square in.

(*c*) 1 square yd. = 3 ft. × 3 ft.
= 9 square ft.
= 36 in. × 36 in. = 1,296 square in.

5. For measuring land we have the acre, which is 4,840 square yd. A square field with sides 70 yards long has an area of :

70 yd. × 70 yd. = 4,900 square yd.

And that is just over an acre. The difference is only :

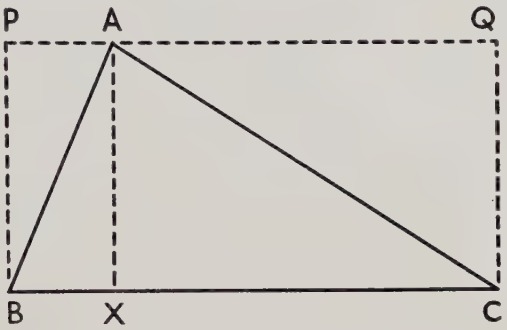
4,900 — 4,840 = 60 square yd.

And that is a piece 5 yd. by 12 yd., a very small part of the whole field.

But a field 88 yards long by 55 yards wide, or 121 by 40, or a very narrow field 220 by 22, or even a strip 968 by 5 would each be an acre.

* * *

A triangle is another shape whose area is easy to calculate.



An oblong has been drawn round the triangle ABC; the base of the oblong, BC, is the same as the base of the triangle. We have also drawn the perpendicular, AX, from A to BC.

We may see that the triangle APB may be cut off, turned over, and placed exactly on ABX. And that AQC may be placed exactly on ACX. The point of this is that we thus show the area of the triangle to be half the area of the oblong.

Area ABC = $\frac{1}{2}$ area of PQCB
= $\frac{1}{2}$ BC × PB.

We notice also that PB = AX, the height of the triangle. So :

Area of triangle ABC
= $\frac{1}{2}$ BC × AX
= $\frac{1}{2}$ base × height.

That is, to find the area of a triangle we measure the base and the height, multiply these two lengths, and take half of this area.

We find the base of a triangle to be

5 inches, and the height 4 inches.

Area $= \frac{1}{2} \times 5$ in. $\times 4$ in.
$= 10$ square in.

(The easy way is : $\frac{1}{2}$ of 4 in $= 2$ in. 2 in $\times 5$ in. $= 10$ square in.)

* * *

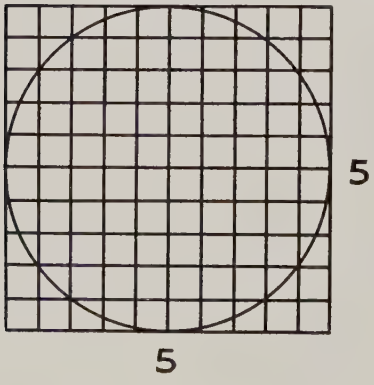
1. When we measure circles we find that the circumference of a circle divided by its diameter is almost $3\frac{1}{7}$.

If we have a small wheel we can measure the distance across it through its centre; that is the diameter.

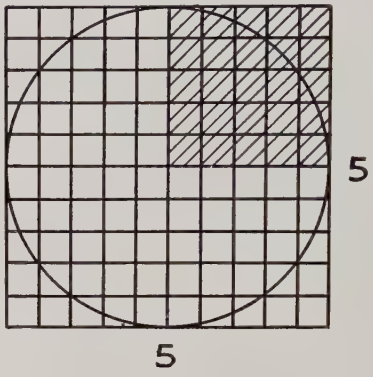
To measure the circumference we can put a length of thin string round the rim of the wheel, and measure the length that just goes round.

We multiply the diameter by $3\frac{1}{7}$, and that should give us the length of the circumference. We may not get that length exactly the same, because our measurements are not quite exact.

2. (*a*) It is not easy to measure the area of a circle, but we can get a rough measurement in this way. We draw a square with sides 5 inches long, and a circle touching the sides at their mid-points. We divide the sides into half-inches, and join across. The area of each small square is:
$\frac{1}{2}$ in. $\times \frac{1}{2}$ in. $= \frac{1}{4}$ square in.



(*b*) We count the number of complete squares in the circle. If a part square is more than half we count it; if less than a half we do not count it. We multiply the total by $\frac{1}{4}$ square inch, and so obtain, roughly, the area of the circle.



(*c*) The shaded square is the square on the radius of the circle. Its area is :

$2\frac{1}{2}$ in. $\times 2\frac{1}{2}$ in. $= \frac{5}{2} \times \frac{5}{2} = \frac{25}{4}$
$= 6\frac{1}{4}$ square in.

We now multiply this area by $3\frac{1}{7}$:

$6\frac{1}{4} \times \frac{1}{7} = \frac{25}{4} \times \frac{1}{7} = \frac{25}{28}$
and $\frac{3}{4} + \frac{25}{28} =$
$\frac{21}{28} + \frac{25}{28} = \frac{46}{28} =$
$\frac{23}{14} = 1\frac{9}{14}$.

$$\begin{array}{r} 6\frac{1}{4} \\ \times\ 3\frac{1}{7} \\ \hline 18\frac{3}{4} \\ \frac{25}{28} \\ \hline 19\frac{9}{14} \end{array}$$

(*d*) To find the area of a circle, we measure the radius, find the area of the square on the radius, and multiply this area by $3\frac{1}{7}$.

Area of circle $= 3\frac{1}{7} \times$ area of square on radius.

(*e*) A wheel is 28 inches across. The radius is 14 inches.

Area of square on radius
$= 14$ in. $\times 14$ in.
$= 196$ square in.

Area of circle enclosed by

wheel = $196 \times 3\frac{1}{7}$ square in.

196 = 616 square in.

$\times 3\frac{1}{7}$ If we want the answer

588 in square feet we divide

28 by 144.

616 616 square in.

$= \frac{616}{144}$ square ft.

= 4 square ft., and 40 square in.

Or, we could work in feet. 14 in. = $1\frac{1}{6}$ ft.

Area of square on radius

= $1\frac{1}{6}$ ft. $\times$ $1\frac{1}{6}$ ft.

= $\frac{7}{6} \times \frac{7}{6}$ square ft.

= $\frac{49}{36}$ square ft.

Area of circle

= $3\frac{1}{7} \times \frac{49}{36}$ square ft.

= $\frac{22}{7} \times \frac{49}{36}$ square ft.

(Cancel 7 and 2)

= $\frac{77}{18}$ square ft.

= $4\frac{5}{18}$ square ft.

As a check : $\frac{1}{18}$ of 144 = 8, so $\frac{5}{18}$ = 40. $\frac{5}{18}$ square ft. = 40 square in.

TRY THESE—7

1. Find the areas of the following oblongs and squares : (*a*) 6 in. by 7 in. (*b*) 9 in. by $4\frac{1}{2}$ in. (*c*) $3\frac{1}{2}$ in. by $4\frac{1}{2}$ in. (*d*) $4\frac{1}{2}$-in. square. (*e*) 1 ft. by 9 in. (*f*) 2 ft. 6 in. by 3 ft. 9 in. (area in square ft.). (*g*) 3 yd. 1 ft. by 1 yd. 2 ft. (area in square ft.). (*h*) Square with sides 27 in. long (area in square ft.).

2. Find the areas of these triangles : (*a*) Base 8 in., height 9 in. (*b*) Base 7 in., height 14 in. (*c*) Base 1 ft. 6 in., height 11 in. (*d*) Base 3 yd. 2 ft., height 1 yd. 1 ft. (area in square ft., and also in square yd.).

3. Draw a circle of radius 2 in. What are : (*a*) Diameter ? (*b*) Circumference ? (*c*) Area ?

4. Find the radius, circumference, and area of these circles : (*a*) Diameter 1 in. (*b*) Diameter 5 in. (*c*) Diameter 1 ft. 6in. (work in feet). (*d*) Diameter $3\frac{1}{2}$ in.

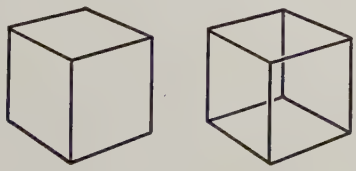
5. (*a*) Find the number of square yards in a square mile (1,760 yards in 1 mile). (*b*) How many acres in a square mile ?

(*Answers on page 142.*)

(8)

VOLUMES

1. Here is a drawing of a 1-inch cube. Every edge is 1 inch long; though we do not show the lengths exactly in a drawing. There are 12 of these lengths: 4 at the top, 4 at the bottom, and 4 join top and bottom. Only 9 of these lengths are visible to us, but the wire framework beside it shows them all.



Each face has an area of one square inch. There are 6 faces. 3 of these we can see, and there is one hidden face behind each of the three. They are all visible in the wire framework.

2. The whole space filled by the cube is its volume. So we have :

edges—lengths

faces—areas

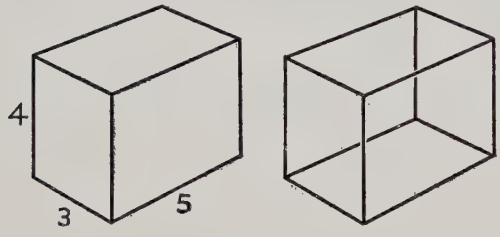
space filled—volume

3. The volume of an inch cube is

called a cubic inch. Once more it is the size that counts, and not the shape. We might mould an inch cube out of modelling clay, and then we might remould it into many shapes. The volume would still be a cubic inch, because the size has not changed.

* * *

We might have a container, 1 yd × 1 yd. × 1 yd., holding 1 cubic yard of sand. There would still be 1 cubic yard of it when it was tipped into a sand pit.



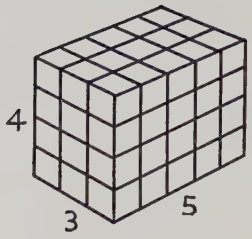
1. The drawing represents the shape called an oblong prism—oblong, because all the faces are oblongs. It is 5 inches long, 3 inches wide, and 4 inches high.

(*a*) The wire framework shows all the edges. The 4 long lines are each 5 inches long, the 4 short lines are each 3 inches long, and the 4 upright lines are each 4 inches long.

(*b*) The 6 faces are equal in pairs, opposite one another. 2 are 5 inches by 4 inches, 2 (top and bottom) are 5 inches by 3 inches, and the 2 end ones are 4 inches by 3 inches.

The total *area* is :

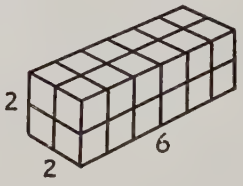
2 × 5 in. × 4 in. + 2 × 5 in. × 3 in. + 2 × 4 in. × 3 in. = 40 square in. + 30 square in. + 24 sq. in. = 94 *square* in.



(*c*) This drawing shows the prism cut up into 1-inch blocks, each a cubic inch. There are 4 layers of blocks. In each layer there are 3 × 5 = 15 blocks, or cubic inches.

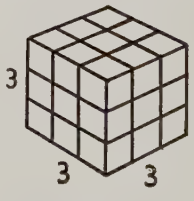
So the whole *volume* is 4 × 3 × 5 *cubic* inches = 60 cubic inches.

Volume of oblong prism = length × breadth × height.



2. When two of the dimensions are equal we have a square prism. Here we have width and height each 2 inches. The length is 6 inches.

Volume = 2 in. × 2 in. × 6 in.
= 24 cubic inches.



3. When all three dimensions are equal we have a cube. In this cube length, breadth, and height are each 3 inches.

Volume = 3 in. × 3 in. × 3 in.
= 27 cubic inches.

TRY THESE—8

1. Make a drawing to represent roughly a prism 4 feet long, 2 feet wide, 3 feet high.

Draw it as it would appear with wire for the edges, and no solid sides.

(*a*) How many edges are there? What are their lengths? What is the total length?

(*b*) How many faces are there? What are their areas? What is the total area?

(*c*) What is the volume of the entire prism?

2. Answer the same questions for the following:

(*a*) Prism 5 in. by 4 in. by 6 in.

(*b*) Prism 7 in. by 9 in. by 11 in.

(*c*) Cube with 8-in. edges.

(*d*) Prism $4\frac{1}{2}$ in. by $5\frac{1}{2}$ in. by 1 ft.

(*e*) Cube with $2\frac{1}{2}$-in. edges.

3. (*a*) 1 cubic ft. = ? cubic in.

(*b*) 1 cubic yd. = ? cubic ft.

(*c*) 1 cubic yd. = ? cubic in.

(*Answers on page 143.*)

(9)

DECIMALS

1. When we examine the inches marked off on a ruler, we find some of them divided into tenths. The tenths are very useful for measuring the lengths of lines.

We measure a line, and find it to be $3\frac{7}{10}$ inches long. We have a more convenient way of writing that length. We write:

3·7 inches.

The dot is often called the decimal point. It shows where the whole number ends, and the fraction begins.

14·6 inches stands for $14\frac{6}{10}$ inches.

275·8 feet stands for $275\frac{8}{10}$ feet.

2. We should know how to read numbers which contain decimal points.

5·7 inches. We read that as, "5 point 7 inches."

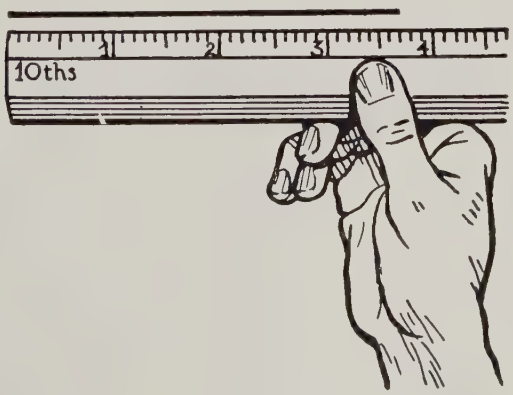
3. The great advantage of writing lengths as inches and tenths of an inch, is that it is quite easy to add and subtract them. The methods are the same as for adding and subtracting whole numbers.

6·8 inches	68 inches
15·7	157
9·6	96
32·1 inches	321 inches

We set the lengths down with the decimal points one under another. The addition is exactly the same as for adding 68, 157, and 96.

4.

37·4 inches	374 inches
− 19·8	− 198
17·6 inches	176 inches



(*a*) Here again, the subtraction is the same as in the sum 374 — 198.

(*b*) There is one small difficulty. 18 inches — 6·7 inches. We easily get over the difficulty by writing 18 inches as 18·0 inches. $18\frac{0}{10}$ inches is, of course, the same length as 18 inches.

18·0 inches	180 inches
— 6·7	— 67
11·3 inches	113 inches

The subtraction is the same as for 180 — 67.

(*c*) We can use the same method to find, say, 42·6 inches minus 27 inches.

42·6 inches	426 inches
— 27·0	— 270
15·6 inches	156 inches

5. We have the same advantage when we multiply or divide by small numbers.

(*a*)

6·8 inches	68 inches
× 4	× 4
27·2 inches	272 inches

The multiplication is the same as for 68 × 4.

(*b*)

4·9 inches
× 10
49·0 inches

From this we can see that to multiply by 10, we need only move the decimal point one place to the right. We can see at once that :

5·8 × 10 = 58·0, or simply 58.

(*c*)

7)40·6 inches	7)406 inches
5·8 inches	58 inches

The division for 40·6 ÷ 7, is the same as for 406 ÷ 7.

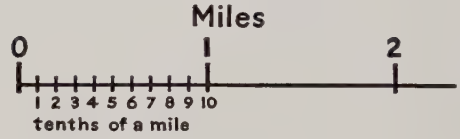
(*d*)

10)17·0 in.
1·7 in.

From this we can see that to divide by 10, we move the decimal point one place to the left. We see at once that :

158 ÷ 10 = 15·8

6. We can measure in tenths with other units as well as inches.



(*a*) Map measurements are often made in miles and tenths of a mile. 27·7 miles = $27\frac{7}{10}$ miles.

(*b*) £3·4 = £$3\frac{4}{10}$. $\frac{4}{10}$, or ·4, of a pound is 8s., so £3·4 = £3 8s. We notice that £·1 = 2s., £·2 = 4s., £·3 = 6s., and so on.

7. We may notice on the ruler that $\frac{5}{10}$ inch = $\frac{1}{2}$ inch. That is, $\frac{5}{10}$ = ·5 = $\frac{1}{2}$. ·5 of anything is $\frac{1}{2}$ of it.

8. We may like to know what comes after the tenths.

365·47 inches

stands for : 300 inches + 60 inches + 5 inches + $\frac{4}{10}$ inch + what?

We are going down in 10's : 100's, 10's, 1's, $\frac{1}{10}$'s. So the next is a tenth of a tenth. $\frac{1}{10} \times \frac{1}{10} = \frac{1}{100}$. The next figure after the tenths stands for hundredths. If we imagine one of the tenths of an inch cut into ten equal parts, each of those tiny bits is a hundredth of an inch.

3·64 inches = 3 inches + $\frac{6}{10}$ inch + $\frac{4}{100}$ inch.

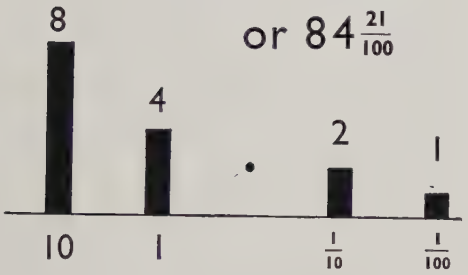
·87 miles = $\frac{8}{10}$ mile + $\frac{7}{100}$ mile.

Any number may be thought of as

being arranged in columns, like this :

hundreds	tens	units	decimal point	$\frac{1}{10}$	$\frac{1}{100}$
		3	·	7	
	1	4	·	6	5
2	7	5	·	8	7
	8	4	·	2	1

$= 84{\cdot}21$
or $84\frac{21}{100}$



TRY THESE—9

1. (*a*) 16·9 feet + 27·4 feet + 36·8 feet.
   (*b*) 46·7 miles + 35·3 miles + 27·6 miles + ·4 mile.
2. (*a*) 45·3 inches — 28·6 inches.
   (*b*) 5·2 feet — 3·7 feet.
   (*c*) 46 miles — 14·5 miles.
   (*d*) 23·6 miles — 15 miles.
3. (*a*) 3·7 inches × 3.
   (*b*) 14·5 feet × 5.
   (*c*) 9·8 miles × 7.
   (*d*) 38·4 × 8.
4. (*a*) Find 8·9 inches ÷ 5;
   (*b*) 38·4 miles ÷ 7.
   (*c*) 54·7 lb. ÷ 8.
   (*d*) £93·4 ÷ 6.

(*Answers on page 143.*)

(10)

PERCENTAGES

Per cent means per hundred. There is nothing very difficult about percentages, especially if we take them step by step. We often write % for per cent.

Step 1 :

1% of £100 is £1 (that is what 1% means).

1% of 100s. is 1s.

1% of 100 yards is 1 yard.

1% of 100 men is 1 man.

10% of 100 men is 10 men.

Step 2 :

1% of £200 is £2. (£1 out of each £100).

1% of 700 men is 7 men.

1% of 25,000 miles is 250 miles.

Step 3 :

1% of £300 is £3.

2% of £300 is twice as much = £6.

5% of £300 is five times as much = £3 × 5 = £15.

8% of 300 men is 24 men.

Step 4 :

4% of £700 is £28. (£4 out of each £100).

6% of £800 is £48.

8% of 900 men is 8 × 9 = 72 men.

Step 5 :

1% of £50 is 10s. (Half of £1.)

5% of £50 is £2 10s. (5 times 1%.)

1% of £25 is 5s. (Quarter of £1.)

Step 6 :

4% of £150 is £6. (£4 out of £100 + £2 out of £50.)

2% of £250 is £5. (£4 out of £200 + £1 out of £50.)

6% of £450 is £27.

5% of £125 is £6 5s. (£5 out of £100 + £1 5s. out of £25.)

Step 7 :

(*a*) Businessmen often borrow money which they use to increase their business. They have to pay for the loans, and the payment is usually so much per cent per annum (that is, each year). These payments are called interest.

A man lends £800 at 3% per annum. Each year his interest amounts to £24. In 3 years the interest would be £72.

(*b*) If you have some money saved it is a good idea to invest it in shares. £100 of shares paying 5% per annum would give you £5 a year interest.

(*c*) The Post Office Savings Bank pays $2\frac{1}{2}\%$ interest per annum.

$\frac{2\frac{1}{2}}{100} = \frac{5}{200} = \frac{1}{40}$.

So that $2\frac{1}{2}\%$ is the same as $\frac{1}{40}$.

$£\frac{1}{40} = 6\text{d}$. So that every year, the Post Office pays 6d. on each pound left in the bank, or $\frac{1}{2}$d. per month.

(*d*) If a fraction of a penny comes in the final amount of interest, the bank ignores it. 1s. $8\frac{1}{2}$d., for example, becomes 1s. 8d.

Step 8 :

(*a*) You can turn any percentage into a fraction, e.g.:

$2\% = \frac{2}{100} = \frac{1}{50}$.

$2\frac{1}{2}\% = \frac{2\frac{1}{2}}{100}$. Multiply top and bottom by 2, so

$= \frac{5}{200} = \frac{1}{40}$.

(*b*) Some percentages are commonly used, and you should learn what fractions they stand for, e.g.:

$50\% = \frac{1}{2}$ $33\frac{1}{3}\% = \frac{1}{3}$ $25\% = \frac{1}{4}$

$20\% = \frac{1}{5}$ $10\% = \frac{1}{10}$ $5\% = \frac{1}{20}$

TRY THESE—10

1. What are the following?
   (*a*) 3% of £500.
   (*b*) 5% of 600 men.
   (*c*) 7% of 2,000 lb.
   (*d*) 80% of 500 cattle.
   (*e*) $33\frac{1}{3}\%$ of £150.
2. What are the following?
   (*a*) 1% of £300.
   (*b*) $\frac{1}{2}\%$ of £300.
   (*c*) $1\frac{1}{2}\%$ of £300.
   (*d*) $2\frac{1}{2}\%$ of £300.
   (*e*) $3\frac{1}{2}\%$ of £500.
3. Find : (*a*) $3\frac{1}{2}\%$ of £50. (*b*) $3\frac{1}{2}\%$ of £150. (*c*) $3\frac{1}{2}\%$ of £350. (*d*) $4\frac{1}{2}\%$ of £250.
4. (*a*) What is the interest on £500 for 1 year at 3%?
   (*b*) What is the interest on £150 for 3 years at 4%?
   (*c*) What is the interest on £250 for 6 years at $2\frac{1}{2}\%$?
5. (*a*) I have £7 in the P.O. Savings Bank for 6 complete months. How much is the interest?
   (*b*) What is the interest on £3 for 9 months?
   (*c*) What is the interest on £5 8s. 6d. for 11 months?

(*Answers on page 143.*)

ANSWERS TO ARITHMETIC QUESTIONS

1

1. 3 6 9 12 15 18 21 24
   7 14 21 28 35 42 49 56
   10 20 30 40 50 60 70 80
   27 30 33 36 39 42 45
   63 70 77 84 91 98 105
   90 100 110 120 130 140 150
That is the table of 10's.

2. 5 10 15 20 25 30 35 40
   6 12 18 24 30 36 42 48
   11 22 33 44 55 66 77 88
   45 50 55 60 65 70
   54 60 66 72 78 84
   99 110 121 132 143 154
That is the table of 11's.

3. 175 180 185 190 195 200 205 210 215 220.

4. $0 \times 0 = 0$; $1 \times 1 = 1$; $2 \times 2 = 4$; $3 \times 3 = 9$; $4 \times 4 = 16$; $5 \times 5 = 25$; $6 \times 6 = 36$; $7 \times 7 = 49$; $8 \times 8 = 64$; $9 \times 9 = 81$; $10 \times 10 = 100$; $11 \times 11 = 121$; $12 \times 12 = 144$; $13 \times 13 = 169$; $14 \times 14 = 196$.

5. $15 \times 15 = 225$; $16 \times 16 = 256$; $19 \times 19 = 361$; $20 \times 20 = 400$.

2

1. (*a*) 360 (*b*) 360 (*c*) 233
   − 127 − 233 127
   233 127 360
2. 9,876 8,765
   − 6,789 5,678
   3,087 3,087 and so on.
3. 9,753 8,642
   − 3,579 − 2,468
   6,174 6,174
4. 1,200 days
   − 365
   835
   − 365
   470
   − 365
   105 days
   3 yrs. 105 days
5. 20,000 ft.
   − 5,280
   14,720
   − 5,280
   9,440
   − 5,280
   4,160 ft.
   3 miles 4,160 ft.

3

1. (*a*) 3,015. (*b*) 3,015.
2. (*a*) 56,800 = 568 × 100
   − 568
   56,232 = 568 × 99
   (*b*) 745,000 = 745 × 1,000
   − 745
   744,255 = 745 × 999
3. (*a*) 999. (*b*) 10,101. (*c*) 999,999. (*d*) 987,987. (*e*) 123,321. (*f*) 24,680. (*g*) 333,333. (*h*) 999,999.
4. $13 \times 8 + 6 = 110$.
5. (*a*) $48\frac{1}{2} \times 8 = 388$ pints.
   (*b*) 194s. = £9 14s.
   (*c*) 388 × 9½d. = £15 7s. 2d.
   £15 7s. 2d. − £9 14s. 0d. = £5 13s. 2d.

4

1. (*a*) 42s. 6d. = £2 2s. 6d.
   (*b*) 56s. 8d. = £2 16s. 8d.
   (*c*) $340 \times 3\frac{1}{2} = 1{,}190$d. = 99s. 2d. = £4 19s. 2d.
   OR £2 2s. 6d. + £2 16s. 8d. = £4 19s. 2d.
2. 15 in. can be cut 36 times from 15 yd. Therefore 15 in. can be cut 18 times from half that length or $7\frac{1}{2}$ yd.
3. $147 \div 5 = 29\frac{2}{5}$.
4. $310 \div 8 = 38 + 6$ over. 2 forms of 38, and 6 of 39.
5. £3 each takes $28 \times 3 =$ £84. The remaining £16 is given to 16 people. 16 receive £4, and the other 12 receive £3.

5

1. $15 = 3 \times 5$, $21 = 3 \times 7$, $25 = 5 \times 5$, $35 = 5 \times 7$, $51 = 3 \times 17$.
2. (*a*) 2, 3, 5, 6, 10, 15.
   (*b*) 3, 5, 9, 15.
   (*c*) 2, 3, 4, 6, 8, 12, 16, 24.
   (*d*) 2, 3, 4, 5, 6, 10, 12, 15, 20, 30.
   (*e*) 2, 4, 8, 16, 32, 64.
3. (*a*) 3, 4, 9, 11. (*b*) 3, 9. (*c*) 3, 11. (*d*) 4.
4. 21, 42, 63, 84, 105.
5. (*a*) 12. (*b*) 12. (*c*) 12. (*d*) 16. (*e*) 27. (*f*) 125. (*g*) 36.

6

1. (*a*) 10s. (*b*) 2s. 6d. (*c*) 1s. 9d. (*d*) 1 lb. 8 oz. (*e*) 10 cwt.
2. (*a*) 6s. 8d. (*b*) 13s. 4d. (*c*) 3s. 4d. (*d*) 16s. 8d.
3. (*a*) $\frac{10}{20} = \frac{1}{2}$. (*b*) $\frac{48}{96} = \frac{1}{2}$. (*c*) $\frac{18}{27} = \frac{2}{3}$. (*d*) $\frac{75}{100} = \frac{3}{4}$. (*e*) $\frac{16}{40} = \frac{2}{5}$. (*f*) $\frac{56}{63} = \frac{8}{9}$. (*g*) $\frac{14}{49} = \frac{2}{7}$. (*h*) $\frac{125}{1000} = \frac{1}{8}$.
4. (*a*) $\frac{19}{12} = 1\frac{7}{12}$. (*b*) $\frac{8}{6} = \frac{4}{3} = 1\frac{1}{3}$. (*c*) $\frac{20}{10} = 2$. (*d*) $4\frac{21}{12} = 5\frac{9}{12} = 5\frac{3}{4}$. (*e*) $7\frac{77}{36} = 9\frac{5}{36}$.
5. (*a*) $\frac{7}{12}$. (*b*) $\frac{3}{10}$. (*c*) $\frac{1}{24}$. (*d*) $2\frac{1}{2}$. (*e*) $\frac{7}{10}$. (*f*) $1\frac{1}{3}$. (*g*) $5\frac{2}{12} - \frac{9}{12} = 4\frac{5}{12}$.
6. (*a*) $\frac{8}{35}$. (*b*) $\frac{12}{72} = \frac{1}{6}$. (*c*) (Cancel 2, 3, and 3) $\frac{5}{16}$. (*d*) $\frac{3}{2} \times \frac{4}{9} = \frac{2}{3}$. (*e*) $\frac{10}{3} \times \frac{4}{3} \times \frac{9}{5} = \frac{8}{1} = 8$. (*f*) $\frac{5}{2} \times \frac{7}{6} \times \frac{4}{7} = \frac{5}{3} = 1\frac{2}{3}$. (*g*) $\frac{19}{4} \times \frac{3}{10} \times \frac{5}{3} = \frac{19}{8} = 2\frac{3}{8}$.
7. Invert the divisor, and multiply.
8. (*a*) $\frac{4}{9} \times \frac{3}{2} = \frac{2}{3}$. (*b*) $\frac{4}{5} \times \frac{10}{3} = \frac{8}{3} = 2\frac{2}{3}$. (*c*) $\frac{9}{14} \times \frac{7}{1} = \frac{9}{2} = 4\frac{1}{2}$. (*d*) $\frac{10}{3} \times \frac{9}{5} = \frac{6}{1} = 6$. (*e*) $\frac{20}{3} \times \frac{2}{7} = \frac{40}{21} = 1\frac{19}{21}$. (*f*) $\frac{9}{2} \times \frac{8}{3} = \frac{12}{1} = 12$. (*g*) $\frac{15}{2} \times \frac{4}{5} = \frac{6}{1} = 6$. (*h*) $\frac{1}{2} \times \frac{7}{2} \times \frac{7}{8} = \frac{49}{32} = 1\frac{17}{32}$.
9. (*a*) $\frac{1}{4} = \frac{3}{12}$, $\frac{3}{4} = \frac{9}{12}$. (*b*) $\frac{1}{6} = \frac{3}{18}$, $\frac{5}{6} = \frac{15}{18}$. (*c*) $\frac{1}{8} = \frac{3}{24}$, $\frac{3}{8} = \frac{9}{24}$, $\frac{5}{8} = \frac{15}{24}$, $\frac{7}{8} = \frac{21}{24}$.

7

1. (*a*) 42 square in. (*b*) $40\frac{1}{2}$ square in. (*c*) $\frac{7}{2}$ in. $\times \frac{9}{2}$ in. $= \frac{63}{4}$ square in. $= 15\frac{3}{4}$ square in. (*d*) $\frac{9}{2}$ in. $\times \frac{9}{2}$ in. $= \frac{81}{4}$ square in. $= 20\frac{1}{4}$ square in. (*e*) 1 ft. $\times \frac{3}{4}$ ft. $= \frac{3}{4}$ square ft. (*f*) $2\frac{1}{2}$ ft. $\times 3\frac{3}{4}$ ft. $= \frac{5}{2}$ ft. $\times \frac{15}{4}$ ft. $= \frac{75}{8}$ square ft. $= 9\frac{3}{8}$ square ft. (*g*) 3 yd. 1 ft. $\times$ 1 yd. 2 ft. = 10 ft. $\times$ 5 ft. = 50 square ft. (*h*) 27 in. $\times$ 27 in. $= 2\frac{1}{4}$ ft. $\times 2\frac{1}{4}$ ft. $= \frac{9}{4}$ ft. $\times \frac{9}{4}$ ft. $= \frac{81}{16}$ square ft. $= 5\frac{1}{16}$ square ft.
2. (*a*) $\frac{1}{2} \times 8$ in. $\times 9$ in. $= 36$ square in.
   (*b*) $\frac{1}{2} \times 7$ in. $\times 14$ in. $= 49$ square in.

(*c*) $\frac{1}{2} \times 18$ in. $\times 11$ in. $= 99$ square in. (*d*) $\frac{1}{2} \times 3$ yd. 2 ft. $\times 1$ yd. 1 ft. $= \frac{1}{2} \times 11$ ft. $\times 4$ ft. $= 22$ square ft. $=$ 2 square yd. 4 square ft.

3. (*a*) 4 in. (*b*) $12\frac{4}{7}$ in. (*c*) $12\frac{4}{7}$ square in.

4. (*a*) $\frac{1}{2}$ in.; $3\frac{1}{7}$ in.; $3\frac{1}{7} \times \frac{1}{2}$ in. $\times \frac{1}{2}$ in. $= \frac{22}{28}$ square in. $= \frac{11}{14}$ square in. (*b*) $2\frac{1}{2}$ in.; $15\frac{5}{7}$ in.; $3\frac{1}{7} \times \frac{5}{2}$ in. $\times \frac{5}{2}$ in. $= \frac{275}{14}$ square in. $= 19\frac{9}{14}$ square in. (*c*) $\frac{3}{4}$ ft.; $3\frac{1}{7} \times 1\frac{1}{2} = 4\frac{5}{7}$ ft.; $3\frac{1}{7} \times \frac{3}{4}$ ft. $\times \frac{3}{4}$ ft. $= \frac{22}{7} \times \frac{3}{4}$ ft. $\times \frac{3}{4}$ ft. $= \frac{99}{56}$ square ft. $= 1\frac{43}{56}$ square ft. (*d*) $1\frac{3}{4}$in.; $3\frac{1}{7} \times 3\frac{1}{2} = 11$ in.; $3\frac{1}{7} \times 1\frac{3}{4}$ in. $\times 1\frac{3}{4}$ in. $= \frac{77}{8}$ square in. $= 9\frac{5}{8}$ square in.

5. (*a*) 1,760 $\times$ 1,760 $=$ 3,097,600 square yd. (*b*) 3,097,600 $\div$ 4,840 $=$ 640 acres.

8

1. (*a*) 12 edges 4 at 4 ft. each, 4 at 3 ft. each, 4 at 2 ft. each. Total 36 ft. (*b*) 6 faces. 2 at 4 ft. $\times$ 2 ft. $= 2 \times$ 8 square ft.; 2 at 4 ft. $\times$ 3 ft. $= 2 \times$ 12 square ft.; 2 at 3 ft. $\times$ 2 ft. $= 2 \times$ 6 square ft.; Total 52 square ft. (*c*) 4 ft. $\times$ 3 ft. $\times$ 2 ft. $= 24$ cubic ft.

2. (*a*) Length : $4 (5 + 4 + 6) = 60$ in. Area : $2 (6 \times 5 + 6 \times 4 + 5 \times 4) = 74 \times 2 = 148$ square in. Volume : 6 in. $\times$ 5 in. $\times$ 4 in. $= 120$ cubic in. (*b*) Length : $4 (7 + 9 + 11) = 108$ in. $= 9$ ft. Area : $2 (7 \times 9 + 7 \times 11 + 9 \times 11) = 478$ square in. $= 3$ square ft. 46 square in. Volume : 7 in. $\times$ 9 in. $\times$ 11 in. $= 693$ cubic in. (*c*) Length : twelve 8-in. sides $= 96$ in. Area : 6 $\times$ 8 in. $\times$ 8 in. $= 384$ square in. Volume : 8 in. $\times$ 8 in. $\times$ 8 in. $=$ 512 cubic in. (*d*) Length : $4 (4\frac{1}{2} + 5\frac{1}{2} + 12) = 88$ in. $= 7$ ft. 4 in. Area : $2 (4\frac{1}{2} \times 5\frac{1}{2} + 4\frac{1}{2} \times 12 + 5\frac{1}{2} \times 12) = 289\frac{1}{2}$ square in. $= 2$ square ft. $1\frac{1}{2}$ square in. Volume : $4\frac{1}{2}$ in. $\times 5\frac{1}{2}$ in. $\times 12$ in. $= 297$ cubic in. (*e*) Length : twelve $2\frac{1}{2}$-in. sides $= 30$ in. Area : 6 $\times 2\frac{1}{2}$ in. $\times 2\frac{1}{2}$ in. $= 37\frac{1}{2}$ square in. Volume : $2\frac{1}{2}$ in $\times 2\frac{1}{2}$ in. $\times 2\frac{1}{2}$ in. $= \frac{125}{8} = 15\frac{5}{8}$ cubic in.

3. (*a*) 1,728 cubic in. (*b*) 27 cubic ft. (*c*) $36 \times 36 \times 36 = 46{,}656$ cubic in.

9

1. (*a*) 81·1 ft. (*b*) 110·0 $=$ 110 miles.

2. (*a*) 16·7 in. (*b*) 1·5 ft. (*c*) 31·5 miles (*d*) 8·6 miles.

3. (*a*) 11·1 in. (*b*) 72·5. (*c*) 68·6 miles. (*d*) 307·2.

4 (*a*) 1·7 in. + ·4 in. R. (*b*) 5·4 miles + ·6 mile R. (*c*) 6·8 lb. + ·3 lb. R. (*d*) £15·5 + £·4 R. $=$ £15 10s. + 8s. R.

10

1. (*a*) £15. (*b*) 30 men. (*c*) 140 lb. (*d*) 400 cattle. (*e*) $33\frac{1}{3}\% = \frac{1}{3}$. Therefore £150 $\times \frac{1}{3} =$ £150 $\div 3 =$ £50.

2. (*a*) £3. (*b*) £1 10s. (*c*) £4 10s. (*d*) £7 10s. (*e*) £17 10s.

3. (*a*) £1 15s. (*b*) £3 10s. + £1 15s. $=$ £5 5s. (*c*) £12 5s. (*d*) £11 5s.

4. (*a*) £15. (*b*) £18. (*c*) £37 10s.

5. (*a*) 7 $\times$ 6 halfpence $=$ 1s. 9d. (*b*) 3 $\times$ 9 halfpence $= 13\frac{1}{2}$d. interest $=$ 1s. 1d. (*c*) 5 $\times$ 11 halfpence $= 27\frac{1}{2}$d. Interest 2s. 3d.

English

You speak English every time you open your mouth. You write English whenever you express yourself on paper. But do you know how to speak and write it properly? If you take an interest in the language you use, and learn how it is made up, you will know how to put words together so that they make sense and are understood by other people. Since you think in words, being able to use words properly enables you to think properly, and that means your brain is working better

(1)

PERSONS AND THINGS

On these two pages there are pictures of a number of objects. We give each of them a name. The first, for example, is a teapot.

teapot

top

Such words are often called *nouns*. The word teapot is a noun; the word top is a noun; the word dog is a noun; and so on. We call them nouns when thinking chiefly of the words.

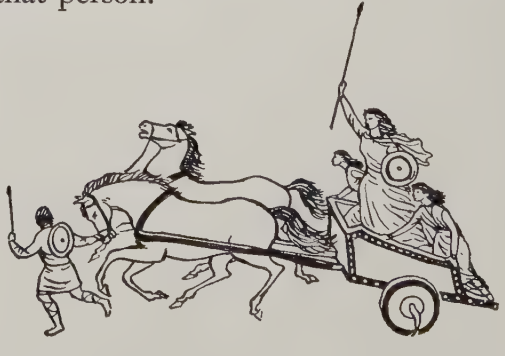
There are some things we may notice about these nouns :

Each of these nouns is the name of a whole class of things : it is common to them all. "Teapot" is the name we use for all teapots; it is the common name of teapots.

That is why we call these nouns common nouns. Each is common to a class of things.

We may have several common nouns for the same thing. The words dog, animal, and pet are common nouns that may all be used for the same creature.

Everyone has his, or her, own proper name that belongs to him, or her, especially. William Thomson is the proper name of a particular person. Boadicea was a particular person. Even though she died about two thousand years ago, that name still stands for that person.



Boadicea.

In a family we have a number of people, all with the same family name. They might all be called Brown. We distinguish them with Christian names: William Brown, Barbara Brown, and so on. Each of these names is a single proper noun.

It is not only people who have proper names. We want to be able to call our own dogs or cats. So we give them proper names : Prince, Ginger, Scamp.

We have proper names for geographical features. Cape Wrath is one particular cape in the north of Scotland. The Alps are one particular group of mountains in central Europe. New York is one particular city in the United States. *Cape Wrath*, *Scotland*, *Alps*, *Europe*, *New York*, and *United States* are all proper nouns.

Kings and queens are known by their Christian names. There are not many suitable names, so there are many repetitions. The first Queen Elizabeth was known, until a few years ago, simply as Queen Elizabeth. But now that we have a second Queen Elizabeth, the first becomes Elizabeth I.

Proper names begin with capital letters. When there are two or more words in the name we give each of them a capital. We write : Arthur James Balfour, Alfred Lord Tennyson, Rocky Mountains, Little Minch, Great St. Bernard. But when little words, like *of* and *the*, come in a proper name, we do not give them capitals. We write : Bay of Biscay, Kitchener of Khartoum, Peveril of the Peak, Newcastle-upon-Tyne, Stratford-on-Avon.

We have many common nouns which stand for collections of things. We call such common nouns collective nouns.

We have many collective nouns for people : crowd, throng, concourse, company, assembly, congregation, group, mob, bevy, and others. The word *bevy* is used properly only for ladies, especially young ladies, and for some kinds of birds. It is rather a flattering word.

When we find collective nouns, we should always note how they are used :

herd—for cattle, horses, and other large animals.

flock—for sheep, and birds, especially geese.

drove—for animals being driven.

pack—for hounds or wolves running together.

A pack of hounds.

TRY THESE—1

1. Which common nouns might be used for yourself? If you go on thinking, you may find quite a lot.
2. Which common nouns may be used for a hen?
3. Make a list of common nouns used for geographical features : land, coast,

sea, lake, river, mountain, etc.

4. Some nouns have a masculine form for males, and a feminine form for females. What are the feminine forms for the following?

baron, boy, cock, duke, earl, emperor, fox, gander, boar, king, lad, lion, lord, lord mayor, master, buck, ram, stag, tiger.

5. We sometimes have special nouns for the young of animals.

What are the nouns used for the young of the following creatures?

cat, cod, dog, duck, eel, fox, goose, hare, herring, lion, swan.

6. Rewrite the following, putting in capital letters where they should be:

sir john franklin sailed to the north of america with the erebus and terror, in an endeavour to find the north-west passage to the pacific ocean. he had friendly relations with the eskimos.

(*Answers on page 160.*)

(2)

SINGULAR AND PLURAL

When a noun means one person or one thing, we say it is in the singular. Words like *boy*, *ship*, *house* are all singular; each stands for one of its kind.

When we want a noun to mean more than one, we change its form. We still consider it the same noun, in spite of the change.

The words *boys*, *ships*, *houses*, all mean more than one, each of its kind. We say they are in the plural. Plural means "more than one."

There are several ways of forming the plural from the singular.

(*a*) We usually add *-s* to the singular:

present—presents, battleship—battleships, desert—deserts, group—groups.

(*b*) When the singular already ends in *-s*, we add *-es*. That gets us out of a difficulty. If we add *-s* to *mass*, we get *masss*, and that would not do at all. We write *masses*. Similarly *bus* becomes *buses*, *gas* becomes *gases*.

Words ending in *-x*, *-ch*, or *-sh*, also need *-es*:

box—boxes, church—churches, bush—bushes, dash—dashes.

(*c*) When the singular ends in *-y*, we change the *y* to an *i* before adding *-es*:

pony—ponies, cherry—cherries, ferry—ferries, mercy—mercies, pity—pities.

But when a vowel (*a*, *e*, *i*, *o*, *u*) comes before the *y*, we do not change the *y*. The reason is that the change

Pony—ponies. Donkey—donkeys.

would give us awkward spellings. We have :

day—days, play—plays, ray—rays, joy—joys, guy—guys, alloy—alloys, donkey—donkeys.

(*d*) We have the word *story*, meaning a tale. The plural is *stories*.

We also have the word *storey*, meaning all the rooms on one floor of a house. The plural is *storeys*.

(*e*) When the singular ends in *-f*, we usually change the *f* to *v*, before adding *-es* :

life—lives, calf—calves, thief—thieves, wolf—wolves, myself—ourselves, yourself—yourselves.

(*f*) There are some rather odd ways of forming the plural :

child—children, ox—oxen, man—men, woman—women, foot—feet, tooth—teeth, goose—geese.

mouse—mice, dormouse—dormice, louse—lice.

crisis—crises, radius—radii.

(*g*) Some names of animals are both singular and plural :

one sheep—many sheep, one deer—many deer, one grouse—many grouse, one salmon—many salmon, one fish—many fish.

One deer—many deer.

But we do use the word *fishes* when we mean fishes of various kinds. We may say, "the trawler made a great catch of fish," and "the various fishes are : herring, cod, halibut, sole, salmon, trout, and so on."

TRY THESE—2

1. What are the plural forms of the following nouns ?

sock, mouth, house, mattress, perch, marsh, wax, raspberry, way, boy, monkey, story, storey, myself, himself, herself, child, ox, tooth, goose, dormouse.

2. Which nouns are the same for both singular and plural ?

(*Answers on page 161.*)

(3)

VERBS

Verbs come next in importance to nouns. They are the doing words. We name something—the noun; and say what it does—the verb.

The Armada sailed.

Armada = noun; sailed = verb.

The cow jumped.

Cow = noun; jumped = verb.

The girl smiled.

Girl = noun; smiled = verb.

Sometimes the verb is more than one word.

The ducks were swimming.

Ducks = noun; were swimming = verb.

The horse is drinking.

Horse = noun; is drinking = verb.

We sometimes talk of things that are happening now; that is in the present. Sometimes we talk of things that have already happened; that is in the past. And sometimes we talk of things that are going to happen; that is in the future.

We change the form of the verb to show which of the three times we mean. We say the verb has three tenses : present tense, past tense, and future tense. (*Tense* comes from an old word that means *time*.)

(*a*) The hunter sets traps for wild animals.

The hunter is setting traps for wild animals.

The verbs are *sets* and *is setting*. Both are in the present tense.

(*b*) The hunter set traps for wild animals.

The hunter was setting traps for wild animals.

The verbs are *set* and *was setting*. Both are in the past tense.

(*c*) The hunter will set traps for wild animals.

The hunter will be setting traps for wild animals.

The verbs are *will set* and *will be setting*. Both are in the future tense.

We change the present to the past by :

(*a*) Adding *-ed*.

jump—jumped, laugh—laughed, spoil—spoiled.

(*b*) If the present already ends in *e* we merely add *d* :

explore—explored, cruise—cruised.

(*c*) If the present ends in *y*, we change the *y* to *i*, and add *-ed* :

marry—married, carry—carried.

(*d*) Sometimes we change present to past by changing the vowel : *Fall* is present; *a* is the vowel. *Fell* is past; *e* is the vowel. Here are other examples :

sit—sat, run—ran, sing—sang, come—came, choose—chose.

(*e*) These are some odd changes in common verbs :

has—had, is—was, are—were, take—took, stand—stood, make—made, lose—lost, send—sent, mean—meant, go—went.

There are two verbs we have to be careful about :

lie—to lie down, and *lay*—lay (an egg) or lay (the table).

lie—present : *lie* or *is lying*.
past : *lay* or *was lying*.

lay—present : *lay* or *is laying*.
past : *laid* or *was laying*.

We might say, "I shall lie down after dinner." "I lay down after

dinner." "I was lying down." The verbs are all tenses of *lie*.

We might also say, "The hen lays an egg." "The hen is laying an egg." "The hen laid an egg." The verbs are all tenses of *lay*.

People sometimes say, "I shall lay down after dinner." What they usually mean is, "I shall lie down after dinner." It is just as bad to say, "I laid down." The past tense of *lie* is *lay*. We say, "I lay down."

The boy lay on the sofa.

The girl laid the table for dinner.

For the future tense we usually put *will* before the verb :

present : the horses gallop.
future : the horses will gallop.

There is one exception. After *I* or *we*, we use *shall* to form the future.

present : I come. We come.
future : I shall come. We shall come.

But when we mean, "I intend to come," we can say, "I will come." In Shakespeare's *Julius Caesar*, Caesar says, "The cause is in my will, I will not come."

When we mean "he intends to" or "he must," we can say "he shall." In the same play, *Julius Caesar*, it says, "We'll send Mark Antony to the senate-house, and he shall say you are not well today." So we have :

I shall, we shall—future.
I will, we will—intend to.
He will, they will—future.
He shall, they shall—intend to, or must.

It is said that a drowning man cried out, "I will drown—no one shall save me !" It seemed that he intended to drown, and no one would be allowed to save him !

Verbs, like nouns, can be singular or plural.

singular : The ship sails.
plural : The ships sail.

A rather odd thing is this. To form the plural of a noun we usually add *-s* to the singular. To form the plural of a verb we usually take off *s*. That does at least save us from having too many s's in a sentence.

singular : growls, maintains, considers.
plural : growl, maintain, consider.

A few verbs form the plural in other ways :

The man *is* climbing. The men *are* climbing.
The girl *was* knitting. The girls *were* knitting.
The lady *has* a horse. The ladies *have* horses.

Another odd thing is, that in the

past tense singular and plural are alike.

The car *ran* swiftly. The cars *ran* swiftly.

The lion *stood* in the way. Lions *stood* in the way.

There is one verb that expresses, not doing, but being. That is the verb *be* itself. It is a peculiar verb in more ways than one.

(*a*) It has many forms, some of them not at all like others :

present : am, is, are.

past : was, were.

future : shall be, or will be.

We also have the old forms, which you may find in the Bible : thou art, thou wast.

(*b*) The verb *be* is often part of a verb :

The ship is lying at anchor.

The whole verb is *is lying*.

The houses were built of stone.

The whole verb is *were built*.

The same word may be either noun or verb—a noun when it is used as a name, a verb when it is used for an action.

I put a stamp on the letter. (*Stamp* is a name, a noun.)

I saw him stamp his foot. (*Stamp* is an action; the word *stamp* is a verb.)

The post was fixed in the ground. (*Post* is a noun.)

The boy will post the letter. (*Post* is a verb.)

TRY THESE—3

1. Write, or rewrite, the following, in the present tense, past tense, and future tense :

(*a*) I walked along the road.

(*b*) He stands on the bridge.

(*c*) He will be ready.

2. Here is a short passage in the present tense. Rewrite it in the past tense (as though it had already happened).

The horseman is riding down the road. He comes to the edge of the wood, and turns to ride along a path that leads down to the river.

3. What is the past tense of each of the following ?

are, choose, have, is, lose, make, tarry, worry.

4. Correct the following :

(*a*) I laid down on the sofa.

(*b*) I shall lay in the sun.

(*c*) I was laying on the grass.

(*d*) I will be there at nine o'clock.

(*e*) Shall you meet me at the station ?

5. The following are in the singular. Rewrite them in the plural.

(*a*) A man was shipwrecked on an island. He made himself a fire, and built a rude hut from branches of trees. Next day he set out to explore the island. (Only the words for a *man*, and verbs that go with them, need be changed.)

(*b*) The dog barks fiercely, and

drives away the intruder.

(*c*) The wolf was rapidly overtaking its prey.

6. This passage is in the singular number and the present tense. Rewrite it in plural number and past tense.

A spring is flowing out from the cliff. The boy bends down and drinks from it. He is no longer thirsty.

(*Answers on page 161.*)

(4)

ADJECTIVES

Look again at the drawings on pages 144–145, to which we gave names. Before each name we can write a word saying what kind. The teapot might be a brown teapot, a big teapot, a hot teapot, and so on. These descriptive words (brown, big, hot) are called adjectives. We can go through the drawings and find adjectives to fit each of them.

An adjective goes with a noun. Even though noun and adjective may be separated, we need have no doubt which noun the adjective belongs to. We can say, "the long crooked lane," or "the lane is long and crooked." In both cases the adjectives *long* and *crooked* belong to the noun *lane*.

There is another kind of adjective which tells how many. Numbers belong to this class :

Twelve Apostles, *Seven* Seas, *ten* fingers, *Twenty* Questions, *three hundred and sixty-five* days.

And there are some adjectives that tell how many, without saying exactly how many :

all, any, many, some, few, several, certain.

Another kind of adjective shows who something belongs to :

my, his, her, its, our, your, their.

A round black pot. *Pot* is a noun, *round* and *black* are adjectives.

TRY THESE—4

1. Find adjectives to describe the lion in the sentence :

A lion stood in the path.

2. Find several adjectives to describe each of the following :

a friend, a castle, a forest, a mountain, a knife.

3. A window with green shutters :

With green shutters is an adjectival phrase describing the window. Find other adjectival phrases to describe a window.

4. Find adjectival phrases to describe :

a tree, an aeroplane, a river, a mouse.

5. Find adjectives to say how many, without saying exactly how many :

(*a*) —— ships were stranded.
(*b*) —— men have red hair.
(*c*) —— people live in Greenland.
(*d*) —— men like fair play.
(*e*) —— a slip 'twixt cup and lip.
(*f*) —— port in a storm.

(5)

ADVERBS AND COMPARISONS

When a descriptive word goes with a verb, it is called, aptly, an adverb.

"The boy was walking along the road," does not tell us how he was walking. But if we say he was walking quickly, or slowly, or lazily, or excitedly, then we have given the verb an adverb which tells how the action was done. Adverbs may be :

(*a*) Adverbs of manner, because they tell the manner in which the action is done, as in the above sentence.

(*b*) Adverbs of time tell when an action is done :
soon, immediately, now, later, presently, afterwards.

(*c*) Adverbs of place tell where an action is done :
here, there, yonder, everywhere, somewhere, nowhere, in, out, inside, outside.

(*d*) Adverbs of degree tell us how intense something is :
very, quite, nearly, almost, completely, utterly, more, most, extremely, excessively, scarcely, hardly, too, rather.

These adverbs are not added to verbs, but to adjectives and adverbs. We say something is *very sweet*; here the adverb *very* goes with the adjective *sweet*. Or we might say an aeroplane flies *very swiftly*; here the adverb *very* goes with *swiftly*, which is an adverb of manner.

We can show intensity by using adverbs of degree. We can also show it by changing the form of an adjective. There are three degrees of comparison. Here is a comparison :

Mary is tall. John is taller. Peter is tallest of all.

Tall, *taller*, *tallest* are the three degrees. The first we call positive, the second comparative, the third superlative. We add *-er* for the comparative, and *-est* for the superlative :

positive :
strong steady pale
comparative :
stronger steadier paler
superlative :
strongest steadiest palest

There are some words that do not fit into this simple scheme :

good, better, best.
bad, worse, worst.
much, more, most.
little, less, least.

When words would be made awkwardly long by adding *-er* and *-est*, we use the adverbs of degree, *more* and *most* :

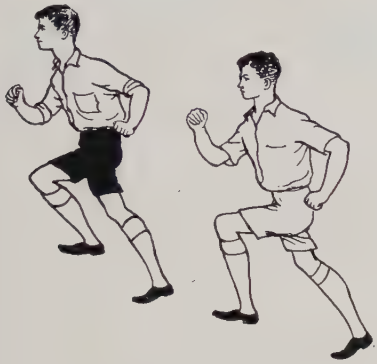
extraordinary, more extraordinary, most extraordinary.

Sometimes we have a choice between the two methods. We choose the one that fits best into our statement :

loveliest or most lovely.

costlier or more costly.

Here is a small point where people sometimes go wrong :



John and Peter were good runners, but Peter was always the better of the two in a race.

When there are only two we use the comparative (in this case *better*), and not the superlative (*best*).

TRY THESE—5

1. What are the three degrees of comparison for the following words?
   small, steadiest, lovely, best, worse, tasteful, costlier, magnificent, less, most.
2. Correct this sentence :
   Mary and Jane were both tall, but Jane was the tallest of the two.
3. Arrange in order of intensity :
   love, do not dislike, adore, like, tolerate, hate, loathe.

(*Answers on page 162.*)

(6)

PRONOUNS AND PREPOSITIONS

Let us look more carefully at pronouns.

It would be tedious to say, or read : "The boy awoke. The boy dressed. The boy came down to breakfast. The boy went to school."

Instead of repeating *the boy*, we can use the pronoun *he*. "The boy awoke. He dressed, he came down to breakfast, and he went to school." Of course, we have repeated the pronoun *he*, but we hardly notice this little word.

There are three sets of pronouns :

(*a*) Pronouns used for the name of the person who is speaking, or the persons, if there are more than one :

singular : I, me, mine.

plural : we, us, ours.

We say these pronouns are in the first person.

(*b*) Pronouns used for the person, or persons, being spoken to :

You, yours, are both singular and plural.

All these pronouns are in the second person.

(*c*) Pronouns used for the name, or names, of persons or things being spoken about :

He, him, his, singular for men and boys.

She, her, hers, singular for women and girls.

It, its, for animals and things.

They, them, theirs, plural for

people, animals and things. These pronouns are in the third person.

But the Queen uses *we* for herself, though it might mean "My advisers and I." Editors of newspapers also use *we*, as if they were speaking for the whole newspaper staff.

People sometimes say, "Between you and I." That is very bad grammar. The correct statement is, "Between you and me." Here are other examples:

Is it for you and me? (This is correct.)

Is it for you or us? (*You* and *us* are correct.)

Him and me went down the road. (Very bad. The pronouns are the subject, and so it should be, *He and I went down the road.*)

There is sometimes confusion in writing between *its* and *it's*. *Its* means *of it*; *it's* is short for *it is*; the apostrophe shows that a letter has been omitted.

It's time you were getting up. (It is time.)

Every dog has its day. (*Its* is here a possessive adjective.)

The verb *be* is, as usual, an oddity :

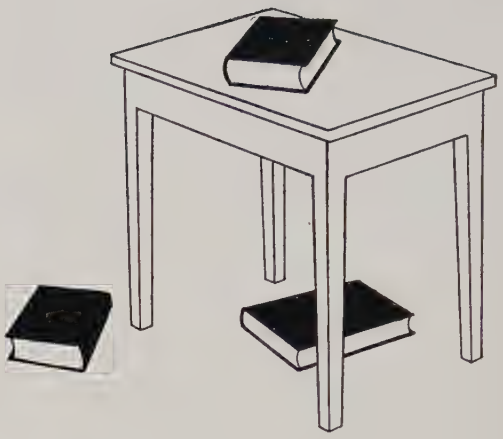
It is I is correct, not *It is me.*

It was he who brought the news. (*He*, not *him.*)

The man who did the deed was he, and he alone. (The man was *he*, not *him.*)

Now think about the two nouns, *book* and *table.*

There may be some relationship between book and table. The book may be on the table, under the table, beside the table.



The words *on*, *under*, *beside* all describe the kind of relationship between book and table. They are called prepositions.

Many prepositions are connected with verbs :

He met *with* an accident.

The hikers came *across* a ruined castle.

They went *out of* the house.

She stumbled *upon* a birds' nest.

* * *

So far we have discussed the noun, verb, adjective, adverb, pronoun and preposition. There still remain the conjunction and the exclamation. A conjunction joins words, phrases and sentences :

I saw Tom and his father, but they did not see me.

The words *and* and *but* are conjunctions.

An exclamation is something we say in surprise or wonder :

Ah, how wonderful !

Oh, that hurts !

Ah and *Oh* are exclamations.

In all, there are eight different kinds of words, called Parts of Speech.

Here is the complete list :—

noun—a name
verb—a doing word
adjective—a descriptive word
adverb—adds to the meaning of a verb or adjective or other adverb
pronoun—stands instead of a noun
preposition—indicates the relation of one word to another
conjunction—joins words, phrases and sentences
exclamation—expresses an emotion.

TRY THESE—6

1. What are the plurals of these?

I, thou, he, she, it, you.
mine, thine, yours, hers.

2. Here is a short passage in the first person. Rewrite it in the third person feminine (as if the speaker were talking about a woman).

My house is on the hill. I have lived there for five years. I have two brothers. We are friendly with our neighbours.

3. Which are the prepositions in the following?

Two men came striding along the street in a great hurry. Their train was due in a few minutes. They ran up the steps to the platform. "We are just in time," said one. "Between you and me," said the other, "I thought we should miss it." "It was a narrow squeak for both of us," said the first.

4. Write *its* or *it's* in the gaps in the following sentence :

—— nearly time the shop had —— door closed.

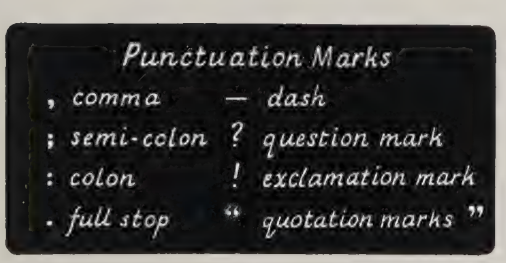
5. Correct the following :

(*a*) He said it was him that did it.
(*b*) It was them who went first.
(*c*) Either him or me should win.

(*Answers on page 162.*)

(7)

PUNCTUATION



We put punctuation marks into our writing in order to make it easier to read. The rule is : if a punctuation mark helps the reader to understand, we put it in. If it does not help the reader, we do not put anything in.

(*a*) A full stop is put at the end of every complete statement, or sentence. When we are reading, either aloud or silently, we pause there. The next sentence begins with a capital letter.

(*b*) A comma indicates a much shorter pause than a full stop. It separates the different parts of a sentence, or the names in a list.

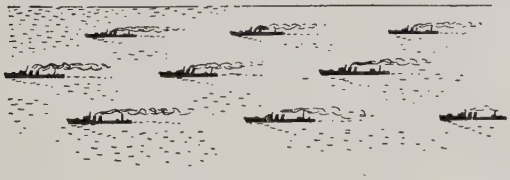
Look at this short passage :

The ships sailed at dawn and

were well on their way by midday it was hoped they might reach their destined port before nightfall or at any rate soon after if they failed to do so they would have to anchor until the sun rose.

That is not easy to read. When we examine it carefully we see that there are three statements, or sentences. The first ends with *midday*, the second with *after*, and the third with *rose*. We put full stops after these words, and write *it* and *if* with capitals.

We look for the shorter pauses, and put commas after *dawn*, *nightfall*, and *so* :



The ships sailed at dawn, and were well on their way by midday. It was hoped that they might reach their destined port before nightfall, or at any rate soon after. If they failed to do so, they would have to anchor until the sun rose.

(*c*) Semi-colons are halfway between commas and full stops. They may be placed at the end of sentences; but only when the subject matter is continued in the next sentence, as in this one.

(*d*) A colon is used for a rather longer pause than a semi-colon. It is often placed before a long list of things, or after an introductory sentence. Colons have been used three times on this page. Can you find them?

(*e*) An exclamation mark comes after an exclamation or a command, or to give emphasis to the sentence. That's easy to understand !

(*f*) A question mark shows that the sentence is a question. How many question marks can you find on this page?

(*g*) A dash is used for punctuation by some writers, but you need not bother with it yet awhile, as you can get along very well without it. It is sometimes useful, however, to use two dashes when you want to keep a phrase separate from the rest of the sentence :

The empress—who had been born in a humble cottage—ascended the throne at the age of thirty.

Here the dashes are like very powerful commas.

(*h*) To separate something even more completely you can use brackets (like these).

(*i*) Do not confuse the dash with the hyphen, which joins together two words into one, like *sea-lion* or *semi-detached*.

(*j*) The apostrophe shows that a letter has been missed out, as in *don't*, *can't*. It is also a way of saying *of*; note its position in these examples :

the boy's hat—the hat of the boy

the boys' hats—the hats of the boys.

(*k*) Quotation marks are sometimes called "inverted commas," though only the first pair are actually turned upside down. We use them when we give the exact words that someone said. For instance :

The housewife said that she had redecorated her kitchen and was proud of it!

Here exact words are not given, so no quotation marks are needed. But if you repeat the words she actually said, the sentence would be :

"I have redecorated my kitchen," said the housewife. "I am proud of it !"

TRY THESE—7

1. Here are some passages to punctuate. Put capital letters where they are needed :

(*a*) the wind grew stronger and stronger until it almost reached hurricane force thunder rolled continuously and lightning flashed with sudden glares it lit up the drenching rain that beat down the sodden crops in the fields.

(*b*) the time had come for her to depart she packed her clothes and took down the two cases to the hall she stood there waiting waiting for the taxi that would take her to the station she waited anxiously because it was now after three and the train went at half-past three.

2. Write the following with quotation marks where they are needed :

(*a*) He told me quite plainly he would be there.

(*b*) He said I will come if I possibly can.

(*c*) Now is the time cried the orator to come to the aid of the party.

(*d*) I want you to promise said Mary that you won't tell. I certainly will not said Alice.

(*Answers on page 162.*)

(8)

KEEPING A DIARY

People sometimes start keeping a diary. They try to write down everything that happens during the day. On the first day they proudly write four pages. On the next day they may write half a page. And then the diary comes to an end.

It would be extremely difficult to

keep up a diary of that kind, though some people do it. But here is an idea for a diary that is fairly easy to keep going. Every day we write down one thing—the most interesting thing that has happened during the day.

There is always something interesting. We may have observed something interesting about trees, or birds, or insects, or the sky. We may have seen something to interest us in the street. Something interesting may have happened at school. We may have heard something that roused our curiosity, or read something interesting in a book, or in the newspaper. There is plenty of room for choice.

When we have learned to choose between what is merely fact, and what

is interesting fact, we have gone a long way towards learning the art of writing. Not, of course, all the way; but we may have learned not to be dull.

The important thing at the moment is to get an exercise book, write today's date at the top of the first page, and below the date the most interesting of today's happenings.

(9)

WRITING LETTERS

Writing letters is an important part of the art of writing.

(*a*) At the beginning of a letter we write our full postal address, and the date. Business firms sometimes receive letters which are altogether useless, because the address is missing.

(*b*) The next point is courtesy. We address our correspondent politely. In a business letter we may begin *Dear Sirs*. To an acquaintance we may write *Dear Mr. Black*, *Dear Mrs. White*, or *Dear Miss Brown*. To a friend we may write *Dear John*, or, if we wish to be more cordial, *My dear John*.

(*c*) We end every letter politely. In a business letter it is sufficient to say *Yours faithfully*. To an acquaintance we may say *Yours truly*. To a friend we may say *Yours sincerely*.

(*d*) There are several things to say about the signature. It should be readable. And unless we are quite sure our correspondent will know who we are, we should write the name in full. If we sign a letter "Jack," our correspondent may be left wondering which Jack has written. A lady should put Miss or Mrs. in brackets after her name, if she is writing to a stranger.

This is how a "thank-you" letter to the mother of a school friend might look :

43 Randolph Road,
Littleton.
September 9, 1957.

Dear Mrs. Black,

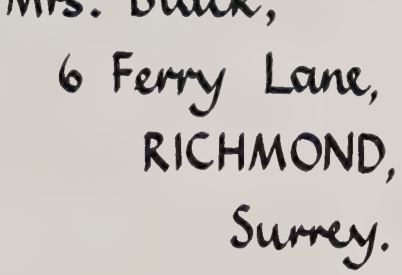
It was very kind of you to invite me to stay with Sheila at your home during the holiday, and I do want to thank you for giving me such a wonderful time. I shall always remember my visit, especially the days we went sailing, and the visit to the theatre.

I had a comfortable journey home yesterday with a corner seat all the way. The sandwiches were delicious.

Thank you once again for all the kindness that you and Mr. Black showed towards me.

Yours sincerely,
Jennifer.

When you are writing to a friend put down the jolly, amusing and attractive things which you know will interest him or her. In that way you will be sure to write something that will be alive and will show your own character. It's a poor sort of person who says he has "nothing to write home about."



How to address an envelope.

Suppose you have had a visit to the seaside. What was the day like? How did the sea look, and feel if you had a bathe? What were the people like on the beach? Did you have a good laugh at some of them? It is not always interesting to be told, "We went fishing." But the exact events of the fishing trip—the boat, the catch, and so on—may be very interesting.

If you have kept the kind of diary already suggested, you should have a record of interesting things that would make a good letter.

(10)

WRITING FOR PLEASURE

Letters and diaries are not the only things we can write. We shall be asked to write essays at school. Here our first concern is to be interesting, and we must imagine that we are telling a friend about something that really interests us. But the arrangement is also very important; it is no good writing down everything that comes into our heads. It is a good idea to make a list of all the aspects of the subject we want to write about, and then to arrange them under headings. For instance, if we were asked to write an essay on ships, we might think of sailing ships, liners, famous

navigators, Vikings, steam turbines, and so on. This is too much to put in one essay, so we must choose how we shall treat the subject. We might deal with the history of ships, writing a little about native canoes, rowing boats, Roman galleys, early sailing ships, the coming of steam and modern liners. Or we might deal with exploration by ships, writing about the South American Indians who drifted on rafts (like the Kon-Tiki) across the Pacific, the Vikings who sailed across the Atlantic, Columbus who discovered America, Vasco da Gama and the route to India, Magellan's and Drake's voyages round the world, and the search for the North-East and North-West Passages. Or again we might tell the story of ships, writing of rowing boats, sailing ships with the various arrangements of sails, paddle steamers, propeller-driven vessels, and coal-burning and oil-driven engines.

Essays are by no means the only things we can write; we might also like to try writing short stories, or plays, or even poetry.

English grammar, spelling and punctuation are only the means to allow us to speak and write clearly, to pass on to other people—by speech or by writing—news and ideas about the exciting world in which we live.

ANSWERS TO ENGLISH QUESTIONS

In some of the answers it is only possible to give examples.

1

1. Boy or girl, person, creature, human being.
2. Hen, bird, fowl, animal.
3. These may be arranged in groups :
   (*a*) Land : continent, country, county, canton, empire, kingdom, republic, city, town, village, hamlet, etc.
   (*b*) Coast : cape, headland, ness, promontory, etc.; bay, gulf, inlet, creek, etc.; isle, island, peninsula, isthmus; channel, strait, etc.
   (*c*) Sea : ocean, sea, lake, tarn.
   (*d*) Rivers : river, tributary, delta, valley, etc.
   (*e*) Mountains : mountain, hill, range, plateau, plain, pass, etc.
4. Baron—baroness, boy—girl, cock—hen, duke—duchess, earl—countess, emperor—empress, fox—vixen, gander—goose, boar—sow, king—queen, lad—lass, lion—lioness, lord—lady, lord mayor—lady mayoress,

master—mistress, buck—doe, ram—ewe, stag—hind, tiger—tigress.

5. Cat—kitten, cod—codling, dog—pup, duck—duckling, eel—elver, fox—cub, goose—gosling, hare—leveret, herring—sprat, lion—cub, swan—cygnet.

6. Sir John Franklin sailed to the north of America with the Erebus and Terror, in an endeavour to find the North-West Passage to the Pacific Ocean. He had friendly relations with the Eskimos.

2

1. Sock—socks, mouth—mouths, house—houses, mattress—mattresses, perch—perches, marsh—marshes, wax—waxes, raspberry—raspberries, way—ways, boy—boys, monkey—monkeys, story—stories, storey—storeys, myself—ourselves, himself—themselves, herself—themselves, child—children, ox—oxen, tooth—teeth, goose—geese, dormouse—dormice.

2. Deer, sheep, fish, trout, snipe.

3

1. (*a*) I walk along the road (*or* am walking).
   I walked along the road.
   I shall walk along the road.
   (*b*) He stands on the bridge (*or* is standing).
   He stood on the bridge.
   He will stand on the bridge.
   (*c*) He is ready.
   He was ready.
   He will be ready.

2. The horseman rode down the road. He came to the edge of the wood, and turned to ride along a path that led to the river.

3. Are—were, choose—chose, have—had, is—was, lose—lost, make—made, tarry—tarried, worry—worried.

4. (*a*) I lay down on the sofa.
   (*b*) I shall lie in the sun.
   (*c*) I was lying on the grass.
   (*d*) I shall be there at nine o'clock.
   (*e*) Will you meet me at the station?

5. (*a*) Some men were shipwrecked on an island. They made themselves a fire, and built a rude hut from branches of trees. Next day they set out to explore the island.
   (*b*) The dogs bark fiercely, and drive away the intruder.
   (*c*) The wolves were rapidly overtaking their prey.

6. Springs were flowing out from the cliffs. The boys bent down and drank from them. They were no longer thirsty.

4

1. Fierce, angry, fearsome.

2. Friend—intimate, kind, loyal, staunch.
   Castle—stately, ancient, proud, ruined.
   Forest—green, gloomy, extensive, impenetrable.
   Mountain—high, lofty, snowclad.

Knife—sharp, blunt, pointed.
3. With many panes, with coloured glass, at the east end of the church.
4. Tree—with many branches. Aeroplane—flying very high. River—glittering in the sun. Mouse—hunting for food.
5. (*a*) Several. (*b*) Some. (*c*) Few. (*d*) Most. (*e*) Many. (*f*) Any.

5

1. Small—smaller—smallest. Steady—steadier—steadiest. Lovely—lovelier—loveliest. Good—better—best. Bad—worse—worst. Tasteful—more tasteful—most tasteful. Costly—costlier—costliest. Magnificent—more magnificent—most magnificent. Little—less—least. Some—more—most.
2. Mary and Jane were both tall, but Jane was the taller of the two.
3. Loathe, hate, tolerate, do not dislike, like, love, adore.

6

1. I—we, thou—you, he—they, she—they, it—they, you—you, mine—ours, thine—yours, yours—yours, hers—theirs.
2. Her house is on the hill. She has lived there for five years. She has two brothers. They are friendly with their neighbours.
3. Along, in, in, up, to, in, between, for, of.
4. It's nearly time the shop had its door closed.
5. (*a*) He said it was he that did it.
   (*b*) It was they who went first.
   (*c*) Either he or I should win.

7

1. (*a*) The wind grew stronger and stronger, until it almost reached hurricane force. Thunder rolled continuously, and lightning flashed with sudden glares. It lit up the drenching rain, that beat down the sodden crops in the fields.
   (*b*) The time had come for her to depart. She packed her clothes and took down the two suitcases to the hall. She stood there waiting, waiting for the taxi that would take her to the station. She waited anxiously, because it was now after three, and the train went at half-past three.
2. (*a*) He told me quite plainly he would be there.
   (*b*) He said, "I will come if I possibly can."
   (*c*) "Now is the time," cried the orator, "to come to the aid of the party."
   (*d*) "I want you to promise," said Mary, "that you won't tell." "I certainly will not," said Alice.

Selection Tests

THESE specimen tests are similar to those taken by most children towards the end of their primary school course, the purpose of which is to discover the type of secondary education from which they are likely to derive the greatest benefit. Children who are preparing for such tests will gain speed and confidence by working through the tests in this book.

GENERAL HINTS

Each test consists of five parts: Mechanical, Mental and Problem Arithmetic; English; Intelligence Questions.

Before attempting the Mechanical sums, copy them on to a piece of paper, taking care to leave sufficient space for any working you may wish to do. Each Mechanical test should take not more than 15 minutes. Try to do them in 12 minutes.

A satisfactory number correct is 20.

When working the Mental arithmetic look for possible relationships between the numbers given. This will save you a lot of time, e.g. How many $2\frac{1}{2}$d. stamps can I buy for 5s.?

$12 \times 2\frac{1}{2}$d. = 2s. 6d.

$2 \times$ 2s. 6d. = 5s.

thus there are two lots of 12 stamps = 24.

Each test should take no more than 10 minutes.

A good mark is 16.

Set down your Problem sums in steps. This will encourage clear thinking and help when you check the work. e.g. A room 12 ft. long and 6 ft. wide has in it a carpet 7 ft. long by 5 ft. wide. What is the area of uncovered floor?

1. Area of room = 12 ft. $\times$ 6 ft. = 72 sq. ft.
2. Area of carpet = 7 ft. $\times$ 5 ft. = 35 sq. ft.
3. Area uncovered = 72 sq. ft. — 35 sq. ft. = 37 sq. ft. Ans.

You are allowed $\frac{1}{2}$ hr. for the problem paper.

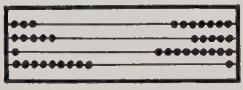
A satisfactory result is three correct.

The Intelligence questions are planned to discover if you can understand instructions and think clearly. Some of the exercises are a little tricky, but none should be beyond you. The secret is to read the questions carefully, and do just what you are asked to do and not anything else. Take your time at first, and never let yourself get flustered. If one problem

is not clear to you, leave it and do the rest of the paper; then come back to the difficult one at the end. With practice you will work more quickly, but never fail to glance back at the question after writing the answer, to check that you have really done what you were asked to do. Eighty per cent correct on English and Intelligence is satisfactory. Speed is not vital, but work as quickly as you can.

The answers to the tests are on pages 185–189.

TEST 1



MECHANICAL ARITHMETIC

Work as quickly as you can.

1. Add

$$\begin{array}{r} 34 \\ 46 \\ 12 \\ \underline{15} \end{array}$$

2. Subtract

$$\begin{array}{r} 7{,}248 \\ \underline{3{,}794} \end{array}$$

3. Multiply

$$\begin{array}{r} 275 \\ \underline{\times\ 4} \end{array}$$

4. Divide

$$6\overline{)1{,}374}$$

5. Add

$$\begin{array}{r} 472 \\ 386 \\ 498 \\ \underline{372} \end{array}$$

6. Subtract

$$\begin{array}{rrr} £ & s. & d. \\ 8 & 12 & 7 \\ \underline{4} & \underline{15} & \underline{9} \end{array}$$

7. Multiply

$$\begin{array}{r} 6{,}429 \\ \underline{\times\ 9} \end{array}$$

8. Multiply

$$\begin{array}{rr} \text{ton} & \text{cwt.} \\ 6 & 7 \\ & \underline{\times\ 6} \end{array}$$

9. Divide

$$9\overline{)3{,}708}$$

10. Divide

$$8\overline{)\begin{array}{rrr} £ & s. & d. \\ 18 & 3 & 4 \end{array}}$$

11. Add

$$\begin{array}{rr} \text{gall.} & \text{qt.} \\ 3 & 1 \\ 4 & 3 \\ \underline{2} & \underline{2} \end{array}$$

12. Add

$$\begin{array}{rrr} \text{yd.} & \text{ft.} & \text{in.} \\ 3 & 2 & 7\tfrac{1}{2} \\ \underline{4} & \underline{1} & \underline{11\tfrac{1}{2}} \end{array}$$

13. Divide

$$5\overline{)\begin{array}{rr} \text{st.} & \text{lb.} \\ 16 & 1 \end{array}}$$

14. Add

$$\begin{array}{rrr} £ & s. & d. \\ 4 & 15 & 6 \\ 2 & 12 & 9 \\ \underline{4} & \underline{3} & \underline{11} \end{array}$$

15. Subtract

$$\begin{array}{rr} \text{lb.} & \text{oz.} \\ 7 & 12 \\ \underline{3} & \underline{13} \end{array}$$

16. Multiply

$$\begin{array}{rr} \text{hr.} & \text{min.} \\ 5 & 17 \\ & \underline{\times\ 4} \end{array}$$

17. Multiply

$$\begin{array}{rrr} £ & s. & d. \\ 6 & 9 & 10 \\ & & \underline{\times\ 11} \end{array}$$

18. Add

$$\begin{array}{r} 132{\cdot}6 \\ 7{\cdot}8 \\ \underline{24{\cdot}7} \end{array}$$

19. Add

$$\begin{array}{rrr} \text{ton} & \text{cwt.} & \text{st.} \\ 3 & 4 & 2 \\ 5 & 15 & 6 \\ \underline{2} & \underline{9} & \underline{4} \end{array}$$

20. Subtract

$$\begin{array}{rrr} £ & s. & d. \\ 16 & 12 & 8 \\ \underline{8} & \underline{17} & \underline{9\tfrac{1}{2}} \end{array}$$

21. Divide

$$30\overline{)42{,}360}$$

22. Divide

$$7\overline{)\begin{array}{rrr} £ & s. & d. \\ 64 & 5 & 1 \end{array}}$$

23. Multiply

$$\begin{array}{rrr} £ & s. & d. \\ 16 & 14 & 8\tfrac{1}{2} \\ & & \underline{\times\ 14} \end{array}$$

24. Multiply

$$\begin{array}{r} 364 \\ \underline{\times\ 58} \end{array}$$

25. Add

$$\begin{array}{rrr} £ & s. & d. \\ 26 & 14 & 10 \\ 7 & 12 & 9\tfrac{1}{2} \\ 3 & 10 & 7 \\ \underline{14} & \underline{2} & \underline{9} \end{array}$$

MENTAL ARITHMETIC

1. Add together 16, 23, and 19.
2. $27 + 5 - 9$.
3. £1 12s. ÷ 12.
4. Take 4s. 9d. from half a guinea.
5. How many gallons in 184 pints?
6. Add the product of 7 and 5 to their difference.

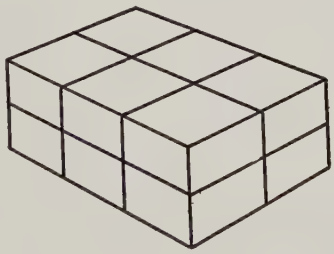
7. What do 240 $2\frac{1}{2}$d. stamps cost?
8. £$\frac{1}{12}$ — £$\frac{1}{16}$. Give answer in pence.
9. A man motored $87\frac{1}{2}$ miles in $2\frac{1}{2}$ hours. What was his average speed?
10. December 1st is a Friday. On which day will New Year's Eve be?
11. 6 pieces of wood, each $7\frac{1}{2}$ in. long, are placed end to end. How far do they stretch?
12. ·25 of 2 tons. How many cwt.?
13. Eggs are $4\frac{1}{2}$d. each. What shall I pay for 2 dozen?
14. I bought equal numbers of 2d. and $2\frac{1}{2}$d. stamps. How many of each did I get for 9s.?
15. A tile is $6\frac{1}{2}$ in. × 8 in. What is its area?
16. Milk is 7d. per pint. I buy a quart each day. How much is my weekly bill?
17. How many 5-oz. packets can I make from 5 lb?
18. A tablecloth is 48 in. square. How much binding is needed to go round the edge?
19. Tom is twice as old as Dick. Their combined ages are 54 years. How old are they?
20. A boy has 22 marbles in one bag and 58 in another. How many must he take from one and put in the other to make them contain equal numbers?

PROBLEMS

1. A greengrocer bought 280 lb. of tomatoes for £15. 20 lb. were bad and thrown away. 160 lb. he sold at 1s. 3d. per lb. If his profit was £2 10s., for how much per pound did he sell the rest of the tomatoes?
2. A train left town A at 8.15 a.m. and arrived at town B, 207 miles away, at 12.45 p.m. What was its average speed for the journey?
3. A postcard measures 6 in. × $3\frac{1}{2}$ in. These are cut from a larger sheet measuring 21 in. × 24 in. How many of these sheets would be needed to make 2 gross postcards?
4. A block of stone, 6 ft. long and 4 ft. wide is worth 18 guineas. A cubic foot of stone costs 4s. 6d. What is the height of the block of stone?
5. A barrel held 1,000 apples, oranges and pears. Out of every eight fruits, four were apples and three were pears. How many of each were there?

INTELLIGENCE QUESTIONS

1. This pile of wooden blocks is placed on a tray and the top and sides painted.

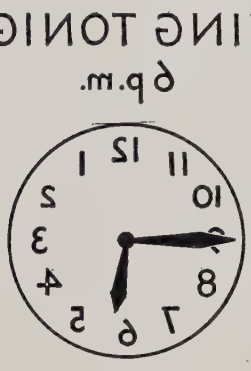


   (*a*) How many bricks are painted on one side only?
   (*b*) How many on two sides?
   (*c*) How many on three sides?
2. In a code RQQT = POOR
   (*a*) What does HQQF mean?
   (*b*) What does RGPPA mean?
   (*c*) Write SHEEP in the code.

(*d*) Write ELEPHANT in the code.

3. A ship sailed 50 miles West, turned South for 30 miles, then West for 20 miles and finally sailed 30 miles due North.
   (*a*) How far did it sail altogether?
   (*b*) Is the ship N., S., E. or West of its starting point?
   (*c*) How far is it from the starting point?

4. This is the reverse of a shop window with a glass faced clock :



   (*a*) What is the message?
   (*b*) How long is it before the shop opens?
   (*c*) If this clock was five minutes slow, think where the hands would be. Now draw the time as you would see it from the pavement.

5. Which word does not belong :
   (*a*) Chair, carpet, stool, table.
   (*b*) Trumpet, drum, gong, triangle.
   (*c*) Walk, run, sing, skip.
   (*d*) Wheat, rye, barley, grass.

6. (*a*) Jack is taller than Mary, but shorter than Bill. Who is shortest?
   (*b*) Harry is older than Bill, who is younger than James, who is older than Harry. Who is the eldest of the three?
   (*c*) Jane runs faster than Sue, but not as fast as Jill. If they race together, who would be last?
   (*d*) Mary sits to the left of Alice, who sits to the left of Jean. Who is in the middle?

ENGLISH

1. Read the following passage, then answer the questions.

"When she re-entered the room, she found its inmates exactly as she had left them. The stout fellow lay upon two chairs, resting his head on his hand, and the squinting man reposed in a similar attitude on the opposite side of the table. Between them sat her grandfather, looking intently at the winner with a kind of hungry admiration, and hanging upon his words as if he were some superior being. She was puzzled for a moment, and looked round to see if anyone else were there. No. Then she asked her grandfather in a whisper whether anybody had left the room while she was absent. 'No,' he said, 'nobody.' "

The Old Curiosity Shop, Dickens.

   (*a*) Which word could be replaced by "occupants"?
   (*b*) How was the squinting man lying?
   (*c*) Write the phrase which means "in much the same way."
   (*d*) What puzzled the girl?
   (*e*) Where was grandfather seated?

2. Fill in the blanks. The first is done for you : A flock of *sheep*.

(*a*) A swarm of ——
(*b*) A herd of ——.
(*c*) A host of ——.
(*d*) A choir of ——.
(*e*) A sheaf of ——.
(*f*) A building of ——.
(*g*) A —— of eggs.
(*h*) A —— of whales.
(*i*) A —— of labourers.
(*j*) A —— of lions.
(*k*) A —— of bishops.
(*l*) A —— of diamonds.

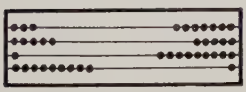
2. Write in full:
(*a*) H.R.H. (*b*) A.D. (*c*) U.K. (*d*) G.P.O. (*e*) N.E. (*f*) C. of E. (*g*) Co. (*h*) E.R.

4. Punctuate the following and add capitals where necessary:
(*a*) we had bread and butter jam cakes jelly and blancmange
(*b*) may i go out at two oclock asked mary
(*c*) the dog rover barked when he couldnt reach his bone
(*d*) help called the boy im falling
(*e*) the queen mary left southampton and began her journey across the atlantic ocean to america
(*f*) wheres my coat asked jim

5. Give the plural of:
daisy, journey, sheep, tooth, shelf, cargo, child, salmon, inch, loaf, enemy, watch.

6. Give a general name for each of the following groups: the first letter is given :
(*a*) car, lorry, bus, tram v——.
(*b*) bed, wardrobe, chair, sideboard f——.
(*c*) milk, water, paraffin, broth l——.
(*d*) chickens, turkey, geese, ducks p——.
(*e*) ants, flies, bees, earwigs i——.
(*f*) carrots, parsnips, turnips, cabbages v——.
(*g*) iron, lead, copper, zinc m——.
(*h*) aunt, uncle, grandmother, niece r——.

TEST 2



MECHANICAL ARITHMETIC

Work as quickly as you can.

1. Divide
$3\overline{)3{,}060}$

2. Subtract
3,906
2,937

3. Multiply
4,073
6

4. Add
46
39
53

5. Add

£	s.	d.
7	14	$8\frac{1}{2}$
2	12	$2\frac{1}{2}$

6. Multiply
4,765
7

7. Divide
$8\overline{)29{,}616}$

8. Subtract

hr.	min.
10	0
4	36

9. Add
314·8
26·7
205·9

10. Subtract

lb.	oz.
8	0
2	9

11. Multiply

ft.	in.
4	10
	5

12. Divide

st.	lb.
6)26	2

13. Subtract

£	s.	d.
12	14	0
7	16	5

14. Multiply

£	s.	d.
5	12	$8\frac{1}{2}$
		6

15. Subtract

£	s.	d.
46	5	2
27	9	4

16. Multiply

gal.	qt.	pt.
7	3	1

× 5

17. Divide

yd.	in.
6)79	6

18. Add

ft.	in.
3	8
4	10
2	1

19. Add

	3,807
	4,296
	3,974
	8,678

20. Subtract

qr.	st.	lb.
4	1	10
2	1	12

21. Multiply

748 × 352

22. Divide

£	s.	d.
23)49	10	11

23. Multiply

£	s.	d.
12	17	$10\frac{1}{2}$

× 23

24. Add

£	s.	d.
16	17	$4\frac{1}{2}$
2	15	8
14	10	9
1	16	$10\frac{1}{2}$
15	17	$11\frac{1}{2}$

25. Add

ml.	fur.
4	6
3	5
2	4

MENTAL ARITHMETIC

1. 121 + 65 − 19.
2. $2\frac{1}{2}$ dozen + $3\frac{1}{2}$ score.
3. £9 15s. ÷ 20.
4. (9 × 15) − (6 × 15).
5. What is the cost of 32 balls at 1s. 3d. each?
6. Add 7s. $6\frac{1}{2}$d., 3s. $9\frac{1}{2}$d., 2s. $11\frac{1}{2}$d.
7. Divide 775 by 25.
8. What is the value of the 2 in the number 9,256?
9. $\frac{2}{3} + \frac{1}{6} + \frac{1}{2}$.
10. I began a journey at 10.40 a.m. and arrived at 12.5 p.m. How long was I travelling?
11. I can buy 3 balls for 1s. 8d. How many would I get for 10 shillings?
12. To a certain number I add 24, then subtract 8 and the answer is 34. What was the number?
13. Which of these were leap years? 1680, 1922, 1864.
14. In a class of 40 children $\frac{7}{8}$ are present. How many are absent?
15. Find the average of 6, 9, 14, 3, 8.
16. What is 5% of £5?
17. In one complete turn a wheel travels $5\frac{1}{2}$ ft. How many times will it turn in travelling one furlong?
18. A grocer buys eggs at 4s. per dozen. He sells them at $4\frac{1}{2}$d. each. What is his profit per gross?
19. A fish tank is $\frac{4}{5}$ full. 6 pints more would fill it. How many quarts will it hold when full?
20. A boy was 14 years old in 1945. When was he 30 years of age?

PROBLEMS

1 A dripping tap wastes a twelfth of a pint in 4 minutes. How much is this in a week? (Answer in gal. pt.)

2. A boy sets off from home at 9.5 a.m. to catch the 10.15 a.m. train at a station $3\frac{1}{2}$ miles away. He completes the first mile by 9.27 a.m. If he continues at this speed, by how many minutes will he miss the train?

3. 250 trains are taking coal to the docks. Each train has twelve 6-ton waggons. If a ship carries 3,600 tons of coal, how many ships are loaded?

4. Divide £80 between Tom, Peter and Harry, so that Peter gets 3 times as much as Harry, and Tom gets twice as much as Peter.

5. A shopkeeper bought 320 toys at 8s. 9d. each. He sold them for £154. What was his profit on each toy?

INTELLIGENCE QUESTIONS

1. (*a*) Write the seventh letter of the alphabet.
   (*b*) Write the letter which comes fourth after J.
   (*c*) Write the letter which comes three before the twentieth letter.
   (*d*) Which is the fourth letter before the third letter after D?
   (*e*) Which letter is halfway between E and M?
   (*f*) If F, H and M were missing, which letter would be the fifteenth?
2. Complete these series:
   (*a*) 1, 3, 5, 7, 9, —, —,
   (*b*) 1, 3, 6, 10, 15, —, —,
   (*c*) 2, 4, 3, 5, 4, —, —,
   (*d*) 4, 8, 16, 32, 64, —, —,
   (*e*) 1, 3, 4, 6, 7, —, —,
   (*f*) 2, 20, 3, 19, 4, —, —.
3. Arrange these in order, then write out the middle one:
   (*a*) Minute, week, hour, month, day.
   (*b*) dog, hamster, horse, elephant, ant.
   (*c*) 1,017, 1,107, 1,170, 1,071, 1,007.
   (*d*) attic, ground-floor, basement, second-floor, first-floor.
4. In a restaurant, ham salad costs less than grilled steak but more than fish and chips. Sausages cost less than fish and chips. Cheese pie is the cheapest meal. Arrange the meals in order of cost, beginning with the dearest.
5. Complete these analogies, choosing the best word from the bracket:
   (*a*) Ice is to skates as snow is to— (shadow, colds, mountain, skis).
   (*b*) Teacher is to pupil as doctor is to —— (illness, patient, hospital, medicine).
   (*c*) Coat is to button as shoe is to —— (sole, sock, leather, lace).
   (*d*) Gun is to bullet as bow is to —— (arrow, string, Sherwood, target).
6. Complete these groups of letters:
   (*a*) ACE, CEG, E – –, G – –
   (*b*) ABBC, BCCD, C – – –, – – – –
   (*c*) AZA, BYB, C – –, – – –
   (*d*) ADC, DGF, G – –, – – –

ENGLISH

1. Read carefully, then answer the questions:

"You spotted snakes with double tongue,
Thorny hedgehogs, be not seen,
Newts and blindworms do no wrong,
Come not near our Fairy Queen.
Weaving spiders come not here,
Hence, you long-legged spinners, hence.
Beetles black approach not near,
Worm nor snail do no offence."

A Midsummer Night's Dream, Shakespeare.

(*a*) What kind of people are saying this?

(*b*) What instructions are they giving to the animals?

(*c*) We usually describe a snake's tongue with a word other than "double." What is the word?

(*d*) Give the word, in the poem, which means "Go away."

(*e*) Which word is used instead of "wrong" or "misdeed"?

2. Give the masculine or feminine of the following:

(*a*) actor ——

(*b*) —— bride

(*c*) mayor ——

(*d*) nephew ——

(*e*) —— countess

(*f*) tiger ——

(*g*) —— witch

(*h*) heir ——

(*i*) host ——

(*j*) —— widow

(*k*) chairman ——

3. Choose the correct word from the bracket:

(*a*) She can run faster than (me, I).

(*b*) They (weren't, wasn't) at all pleased.

(*c*) The sailor (swum, swam) to the shore.

(*d*) Mary and (me, I) are going to school.

(*e*) I would like some of (them, those) sweets.

(*f*) Each of the boys (has, have) a book.

(*g*) He (couldn't, could) hardly lift the parcel.

4. These proverbs are divided into two parts. Match the parts correctly and give your answer as a letter and a number. e.g. Better late than never = (*a*) 7.

(*a*) Better late.

(*b*) All's well.

(*c*) A rolling stone.

(*d*) More haste.

(*e*) Birds of a feather.

(*f*) A fool and his money.

(*g*) New brooms

(*h*) Where there's a will.

(*i*) Out of sight.

(*j*) Once bitten.

1. flock together.
2. sweep clean.
3. out of mind.
4. are soon parted.
5. there's a way.
6. twice shy.
7. than never.
8. that ends well.
9. less speed.
10. gathers no moss.

5. Give one word for each of the following:

(*a*) A person who plays the piano.

(*b*) An instrument which indicates direction.

(*c*) A ship which travels below the surface of the sea.

(*d*) Ten years.

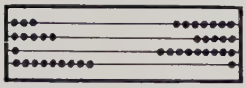
(*e*) A place where grain is stored.

(*f*) A woman in charge of the nurses of a hospital.

6. Complete the following:

(*a*) As sharp as ——. (*b*) As wise as ——. (*c*) As hungry as ——. (*d*) As steady as ——. (*e*) As brown as ——. (*f*) As light as ——. (*g*) As right as ——. (*h*) As good as ——.

TEST 3



MECHANICAL ARITHMETIC

Work as quickly as you can.

1. Divide
$3\overline{)2{,}052}$

2. Subtract
9,705
2,687

3. Multiply
4,072
8

4. Add
24
17
18
36

5. Add
617
493
826
310

6. Subtract

£	s.	d.
8	12	6
4	19	$2\frac{1}{2}$

7. Multiply

ft.	in.
3	7
	4

8. Divide
$8\overline{)£\ s.\ d.\ \ 17\ 5\ 4}$

9. Add

gal.	pt.
3	6
2	7
3	4

10. Divide
$4\overline{)\text{hr. min.}\ \ 63\ 4}$

11. Multiply

£	s.	d.
6	8	10
		5

12. Subtract

ml.	yd.
3	0
1	1,500

13. Divide
$4\overline{)\text{yd. ft. in.}\ \ 7\ 1\ 8}$

14. Add

ml.	fur.	ch.
2	6	7
1	3	4
3	7	8

15. Subtract

£	s.	d.
37	4	6
29	18	7

16. Multiply

ton	cwt.	st.
4	7	3
		4

17. Divide
$5\overline{)\text{yd. in.}\ \ 76\ 4}$

18. Subtract
730·4
28·6

19. Divide
$24\overline{)1{,}080}$

20. Multiply
376
63

21. Add

ton	cwt.	qr.
3	14	3
12	6	2
17	15	2

22. Multiply

£	s.	d.
26	14	$2\frac{1}{2}$
		15

23. Add

yd.	ft.	in.
16	2	10
23	1	$11\frac{1}{2}$
10	0	$8\frac{3}{4}$
17	2	$9\frac{1}{4}$

24. Divide
$40\overline{)60{,}760}$

25. Subtract

st.	lb.	oz.
17	10	3
9	12	8

MENTAL ARITHMETIC

1. Take 7 from 7 thousand.
2. 45 × 25.
3. ·1 + ·01 + 1·4 + 2·04.
4. $\frac{1}{2}$ of $\frac{3}{4} + \frac{1}{2}$
5. 239 × $1\frac{1}{2}$d.
6. 1 yd. 2 ft. 8 in. × 6.
7. 1s. 4d. × 45.
8. I need 36 pieces of ribbon each $6\frac{1}{2}$ in. long. How many yards shall I buy?
9. 2 gal. + 6 qt. + 6 pt. + 3 qt. (Answer in gal.).
10. Multiply 6 by 7, add 12, divide by 9 and subtract 2.
11. Reduce 3 qr. 18 lb. to lb.
12. I buy 160 articles at 3d. each. What is the cost?
13. Lessons begin at 9.5 a.m. and end at noon. There is a $\frac{1}{4}$-hr. break. For how many minutes do lessons last?
14. How many photographs 2 in. × $3\frac{1}{2}$ in. could be stuck on a page 7 in. × 8 in. if no space is left between them?

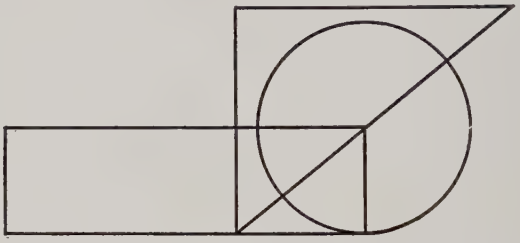
15. Cheese costs 2s. 8d. per lb. How much shall I pay for 10 oz.?
16. A car travels 1 mile in $\frac{3}{4}$ minute. What speed is this in m.p.h.?
17. A train is travelling at 60 m.p.h. It takes the engine 30 seconds to travel from one set of signals to the next. How far apart are the signals?
18. £·125 + ·25s.
19. Divide the product of 8 and 12 by their difference.
20. Stakes are put along the side of a plot of land at 6-ft. intervals. 13 stakes are used. What is the length of the plot in yards?

PROBLEMS

1. A tea chest holds $\frac{3}{4}$ cwt. of tea. At present it is $\frac{7}{8}$ full. How many 4-oz. packets can be made up from it now?
2. Full marks for 3 examination papers are : 200, 240 and 160. A boy gains 75%, 50% and 60%. What is :
   (*a*) His total of marks gained?
   (*b*) His percentage on all three papers together?
3. A man is paid 4s. 9d. per hour for his first 44 hours of work, and a third more for extra hours. If he begins work at 8 a.m. and finishes at 5.30 p.m. from Monday to Friday, taking 1 hour for lunch, and from 8 a.m. to 12.30 p.m. on Saturday, how much is he paid?
4. My clock gains 5 seconds every hour. I put it right at 9 a.m. on Monday. If I do not alter it, what time will it indicate at three o'clock on Wednesday afternoon?
5. A motorist, travelling at an average speed of 32 m.p.h., took 6 hr. 15 min. to complete a journey. What would his average speed have been, if he had taken 25 minutes longer?

INTELLIGENCE QUESTIONS

1. Here is a rectangle, a circle and a triangle.



   (*a*) Put A in the space which is in the circle only.
   (*b*) Put B in the space which is in the circle and triangle, but not the rectangle.
   (*c*) Put C in the space which is in all three shapes.
   (*d*) Put D in the spaces in the rectangle only.
   (*e*) Put X in the space which is in the triangle and rectangle but not the circle.
2. Rearrange these words to make sensible sentences :
   (*a*) On day twenty-fifth Christmas comes December the of.
   (*b*) Enjoy in pools playing rock children most.
   (*c*) Of year is the day the in longest June.
   (*d*) Hay the shines make while sun.
3. In a code EDUCATIONAL is written 1, 4, 7, 2, 6, 8, 9, 3, 0, 6, 5.
   How would you write :
   (*a*) NATION. (*b*) LATE. (*c*) NOTATION.

Write the words for :

(*d*) 5, 6, 0, 1. (*e*) 8, 9, 4, 6, 5. (*f*) 2, 6, 8, 8, 5, 1.

4. (*a*) Write the twelfth letter of the alphabet.

(*b*) Which letter comes eight places later ?

(*c*) Write the ninth letter from the end.

(*d*) Which letter comes exactly in the middle of the first half ?

(*e*) If J, M and P are missed out, which letter comes fifteenth from the end ?

5. Choose the two words, from each group, which have opposite meanings.

(*a*) Start, exit, entry, send, begin.

(*b*) Dry, wet, moist, damp, weather.

(*c*) Calm, smooth, quiet, silence, noisy.

(*d*) Arrive, gone, stay, depart, travelling.

(*e*) Below, near, adjacent, above, lower.

(*f*) Proud, rich, gay, plenty, poor.

(*g*) Dangerous, careful, risk, safe, silly.

(*h*) Increase, gain, contract, grow, expand.

6. In each line a number is wrong. Which is it ?

(*a*) 4, 6, 8, 10, 13, 14, 16.

(*b*) 25, 20, 15, 11, 5.

(*c*) 4, 11, 18, 25, 32, 40.

ENGLISH

1. Read this passage, then answer the questions :

"Next day Amy was rather late at school, but could not resist the temptation of displaying, with pardonable pride, a moist brown paper parcel, before she consigned it to the inmost recesses of her desk. During the next few minutes the rumour that Amy March had twenty-four delicious limes, and was going to 'treat,' circulated through her 'set,' and the attention of her friends became quite overwhelming. Katy Brown invited her to her next party on the spot, Mary insisted on lending her her watch till recess, and Jenny Snow, a satirical young lady who had basely twitted Amy upon her limeless state, promptly buried the hatchet, and offered to furnish answers to certain appalling sums."

Little Women, Alcott.

(*a*) Which phrase means "deep in the desk" ?

(*b*) Which word means "an unconfirmed story" ?

(*c*) Which girl is described as being rather sarcastic ?

(*d*) What does "buried the hatchet" mean ?

(*e*) In which way did Jenny attempt to gain favour with Amy ?

(*f*) What is meant by her "set" ?

2. Form a word from the one given, to go into the sentence :

(*a*) CHOOSE. She made a good —— of book.

(*b*) SERENE. The girl acted the part of the mother with ——.

(*c*) PROCLAIM. A —— was made by the town crier.

(*d*) HERO. He made —— efforts to save the drowning child.

(*e*) SCIENCE. The old man made a discovery of great —— value.

(*f*) ANXIOUS. The parents waited with —— for the return of their son.

3. Arrange these words in pairs of SIMILAR meaning :

Agile, immense, abandon, fraudulent, understand, disaster, limpid, rude, conceal, leave, enthusiastic, dishonest, comprehend, calamity, loathe, nimble, fatigue, massive, insolent, weariness, keen, clear, detest, hide.

4. Rewrite these sentences, choosing the correct word from the bracket :

(*a*) Do not (medal, meddle) with other people's belongings.

(*b*) The window was slightly open and I could feel a (draught, draft).

(*c*) We listened to the first instalment of the (cereal, serial).

(*d*) The boat was swept away by the strong (current, currant).

(*e*) (Dessert, desert) follows the main course of a meal.

(*f*) The (principal, principle) of the college was a capable man.

5. Use these words, in the following sentences :

TRANSLUCENT, RELUCTANT, ASSEMBLED, ANONYMOUS, ELOCUTION, INAUDIBLE, FERTILE, MARINER.

(*a*) The —— land produced an abundant harvest.

(*b*) He received an —— letter so he did not know who sent it.

(*c*) The boy was —— to tell his father of the broken window.

(*d*) The speaker, on the platform, was —— at the back of the hall.

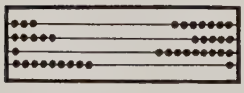
(*e*) The —— told stories of his early days at sea.

(*f*) Frosted glass was used because of its —— qualities.

(*g*) Everyone —— in the large hall.

(*h*) The girl spoke well in her—— examination.

TEST 4



MECHANICAL ARITHMETIC

Work as quickly as you can.

1. Add

	29
	33
	84

2. Subtract

	897
−	328

3. Add

£	s.	d.
2	7	5
1	12	4
3	10	8

4. Divide $6)1{,}806$

5. Add

£	s.	d.
	12	7	8
	9	12	10

6. Divide $7)2{,}933$

7. Subtract

£	s.	d.
8	12	10
3	11	11

8. Multiply

675
× 8

9. Divide

ton	cwt.
6)38	14

10. Multiply

325
× 5

11. Subtract

st.	lb.
6	2
− 3	8

12. Multiply

ft.	in.
3	9
×	5

13. Divide

min.	sec.
5) 36	5

14. Add

gal.	pt.
2	4
3	5
1	3

15. Multiply

354
× 70

16. Add

lb.	oz.
6	12
7	5
4	6

17. Subtract

7,000
2,586

18. Add

hr.	min.	sec.
2	15	30
3	30	45
2	10	51

19. Divide

ton	cwt.	lb.
10)23	11	8

20. Multiply

yd.	in.
3	6
	7

21. Subtract

cwt.	st.
15	3
4	6

22. Add

£	s.	d.
16	12	10
3	18	7
24	10	$8\frac{1}{2}$
12	15	$7\frac{1}{2}$

23. Divide

103)4,120

24. Multiply

£	s.	d.
12	6	$10\frac{1}{2}$
		21

25. Add

76,342
8,079
61,874
35,295

MENTAL ARITHMETIC

1. $11 + (6 \times 3) - 9$.
2. $(6 + 2) \times (6 - 2)$.
3. $625 \div 25$.
4. How many lb. in 4 st. 12 lb.?
5. Add 5 halfcrowns, 5 florins, 5 shillings and 5 threepenny bits.
6. Write in figures: one hundred and fifty thousand and five.
7. How much change is there from £5 after spending £1 12s. 9d.?
8. Find the sum of all the even numbers between 9 and 19.
9. Find the cost of 12 yd. of tape at $\frac{1}{2}$d. per foot.
10. Ten shillings is divided between two people so that one gets half as much as the other. How much does each get?
11. Six years ago, a girl was a third of her present age. How old is she now?
12. How many 2-oz. packets can be made from $2\frac{1}{2}$ lb. of tobacco?
13. A box of crayons weighs $3\frac{1}{2}$ oz. How much would 16 boxes weigh?
14. How many minutes are there from 10.35 a.m. until noon?
15. A piece of wire, 24 in. long, is bent to make a square. What is the area of this square?
16. 20% of £1 + 5% of £2.
17. A money-box held 15 shillings in equal numbers of shillings and sixpences. How many coins were in the box?
18. How many pieces, $4\frac{1}{2}$ in. long, can be cut from 2 yd.?
19. ·75 of 6 hours. How many minutes?
20. If you double a number and add 14, the answer is 70. What is the number?

PROBLEMS

1. It takes $1\frac{1}{2}$ oz. of wool to knit a sock. How many dozen pairs can be knitted from 18 lb. of wool?
2. A carpenter has a plank of wood 15 ft. 9 in. long. He cuts off three equal pieces and finds he has $\frac{1}{7}$ of the plank left. What is the length of each piece cut off?
3. A housewife buys a joint of meat

weighing $3\frac{1}{4}$ lb. and receives 2s. 5d. change from 10s. How much change would she have received if the joint had weighed 3 lb.?

4. Mr. and Mrs. Brown had tea in a café. Mr. Brown had an extra cup of tea, costing 4d., and Mrs. Brown had an extra ice cream, costing 9d. The total bill was 5s. 7d. What was Mr. Brown's share of this?

5. A room, measuring 19 ft. × 13 ft., has a carpet on the floor which leaves an uncovered edge of 6 in. all round. What is the cost of the carpet at 17s. 6d. per sq. yd.?

INTELLIGENCE QUESTIONS

1. Put these groups of sentences into their correct order:

(i) (*a*) He cracked the shell on a stone.
(*b*) A bird was seeking his breakfast.
(*c*) The bird had an enjoyable meal.
(*d*) He found a fine snail.

(ii) (*a*) Our opponents led at half-time.
(*b*) The result was a draw.
(*c*) Smith scored the equalizer.
(*d*) We kicked off at 3 p.m.

2. Dick and Jane like games. Tom and Mary like concerts. Jane and Harry like dancing. Dick and Mary like films.

(*a*) Who likes concerts only?
(*b*) Who plays games and dances?
(*c*) Who likes dancing only?
(*d*) Who likes both films and concerts?
(*e*) Who likes films and games?
(*f*) Which boy would not go to football, nor to films nor to dancing?

3. If A = 1, B = 2, C = 3, D = 4, E = 6, F = 7, G = 10, what do these make:

(*a*) A + C + E.
(*b*) G + D − C.
(*c*) C × F × G.
(*d*) $\frac{E}{F} \times \frac{B}{C}$.

4. (*a*) Engine is to train as horse is to —— (driver, load, cart, harness).
(*b*) Well is to strong as ill is to —— (doctor, weak, nurse, absent).
(*c*) Hunger is to food as thirst is to —— (water, lemonade, drink, quench).
(*d*) School is to pupil as college is to —— (lecturer, science, student, degree).

5. A boy walked 100 yd. East from the Square to the Church, then 50 yd. South, 50 yd. West and finally turned due North. When he returned to the road, joining the Square and the church, how far was he from his starting point?

6. Here is the reverse of an office door:

J. E. MERRYWEATHER
AREA MANAGER
FINE FURNITURE Co.
9 a.m.-5 p.m. Mon.-Fri.

(*a*) What is the name of the occupant of the office?
(*b*) What is his position in the Company?
(*c*) Is he there on Saturday?
(*d*) How many hours, per week, is the office open?

ENGLISH

1. Read carefully, then answer the questions.

"You can fancy what weary lonesome wanderings I had, through the dirty suburbs, and along the burning streets, under a fierce May sun with east wind, 'seeking through the nation for some habitation !' At length, Jane sent me tidings of innumerable difficulties overcome; and finally arrived herself; with the furniture all close following her, in one of Pickford's Trade-boats. I carried her to certain of the hopefullest looking houses I had fallen in with, and a toilsome time we anew had."

Carlyle, in a letter to his brother.

(*a*) What activity was the writer describing ?

(*b*) Which season of the year was it ?

(*c*) Was he in town or country ?

(*d*) Which words, in the passage, mean "after a while" ?

(*e*) What does "innumerable" mean ?

(*f*) Did the writer show Jane every house he had seen ? How do you know ?

2. Arrange these words in pairs of OPPOSITES.

bless, wealth, disperse, temporary, stationary, ebb, attract, expand, generous, refuse, captivity, coarse, flow, assemble, repel, mean, curse, permanent, poverty, contract, fine, accept, freedom, mobile.

3. Choose the correct word from the bracket in the following sentences :

(*a*) Peter, as well as John (was, were) at the station.

(*b*) The cat (sprang, sprung) at the mouse.

(*c*) All of you, but one (have, has) the answer correct.

(*d*) The girl (sung, sang) the song well.

(*e*) John and his friend (has, have) gone home.

(*f*) She said that you (done, did) it.

4. Write in full :

(*a*) J.P. (*b*) l.b.w. (*c*) O.H.M.S. (*d*) C.O.D. (*e*) U.S.A. (*f*) M.A. (*g*) B.C. (*h*) A.M.

5. Put in the apostrophe where it is required :

(*a*) The mans pipe fell with a clatter.

(*b*) The childs bicycle was brand new.

(*c*) The childrens toys were scattered about the floor.

(*d*) The girls hats were hung in the cloakroom.

(*e*) Lying forgotten in the road, were the mens tools.

(*f*) There was a sale of ladies clothes at the new shop.

6. Write down the two words which rhyme from each line :

(*a*) Rough, dough, cow, sew, cough.

(*b*) Harbour, cable, caber, jabber, neighbour.

(*c*) Loose, house, lose, goose, rouse.

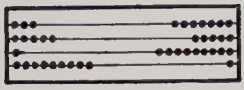
(*d*) Loaf, prove, loathe, sloth, clothe.

(*e*) Rim, kin, hymn, psalm, autumn.

(*f*) Poise, seize, cease, pies, bees.

(*g*) Borough, tough, how, mow, snuff.

TEST 5



MECHANICAL ARITHMETIC

Work as quickly as you can.

1. Add
   27
   9
   31
   8

2. Subtract
   476
   328

3. Add

£	s.	d.
12	14	$6\frac{1}{2}$
3	8	$7\frac{1}{2}$

4. Divide
   4)9,472

5. Multiply
   1,582
   3

6. Subtract
   8,260
   3,527

7. Divide
   8)2,528

8. Multiply

hr.	min.
4	30
	5

9. Subtract

st.	lb.
6	5
2	9

10. Add

fur.	ch.
3	5
2	7
7	4

11. Multiply
    6,431
    40

12. Subtract

£	s.	d.
18	14	7
12	16	8

13. Divide
    4)17 gal. 2 qt. 0 pt.

14. Add

hr.	min.
3	32
12	25
7	18

15. Multiply
    3 st. 5 lb. 4 oz.
    4

16. Divide
    11)15 ft. 7 in.

17. Subtract

ml.	fur.
23	4
9	5

18. Add

£	s.	d.
16	14	$10\frac{1}{2}$
12	18	$8\frac{1}{2}$
18	12	$11\frac{1}{2}$
24	16	3

19. Multiply
    475
    38

20. Divide
    8)22 ton 4 cwt. 0 qr.

21. Multiply

£	s.	d.
13	7	$8\frac{1}{2}$
		17

22. Divide
    80)44,640

23. Add

£	s.	d.
134	2	$8\frac{1}{2}$
16	18	$2\frac{1}{2}$
14	0	10
7	15	$4\frac{1}{2}$

24. Subtract
    800·3
    275·4

25. Add
    682
    593
    875
    264
    107
    985

MENTAL ARITHMETIC

1. 8·1 ÷ ·9.
2. 2 ft. 3 in. × 1,760. (Answer in miles.)
3. Arrange in order, beginning with the smallest : $\frac{1}{2}$, $\frac{5}{6}$, $\frac{1}{3}$, $\frac{11}{12}$, $\frac{1}{4}$.
4. How many times is 14 contained in 168?
5. Add 12s. 6d., 4s. $9\frac{1}{2}$d., 6s. $7\frac{1}{2}$d.
6. Divide 2,442 by six.
7. $5\frac{1}{2}$ gallons at $1\frac{1}{2}$d. per pint. How much is this?
8. Ten lines are drawn equidistant from each other. From the first to the last line is $2\frac{1}{4}$ inches. How far apart are the lines from each other?
9. Ten children stand on the edge of a circle, each a yard apart. What is the circumference of the circle?

10. Fill in the missing figures

$$\begin{array}{r} 32* \\ 2*6 \\ *73 \\ \hline 1{,}063 \end{array}$$

11. I counted 20 books in a shop window, each marked at half a guinea. How much were they worth? (Answer in £ s. d.)
12. How many children can have $\frac{1}{3}$ pint of milk from 10 gallons?
13. A tank is $\frac{1}{2}$ full. 2 gal. are drawn off and it is then $\frac{1}{3}$ full. What is the capacity of the tank?
14. Four children weigh 5 st. 10 lb., 6 st. 4 lb., 6 st. 2 lb. and 4 st. 8 lb. What is their average weight?
15. A number of 28 lb. bags of sand weigh 12 cwt. How many bags?
16. A book and a pencil cost 1s. 2d. The book costs 8d. more than the pencil. What does each cost?
17. $1\frac{3}{8} \div \frac{3}{16}$.
18. £1·75. How many sixpences?
19. 1 gal. 1 qt. 1 pt. costs 4s. 7d. What is the cost of a gallon?
20. Tiles, 3 in. × 2 in., costs 1s. each. How much will it cost to tile a surface 4 ft. × 10 in.?

PROBLEMS

1. A shopkeeper bought 100 articles at 5 for 4d. and another 100 articles at 10 for 1s. He sold them all at the same price and made 50% profit. What was his selling price for each article?
2. A hall holds 500 people. 250 seats were sold at 2s. 6d. each, 150 at 1s. 6d. each and the rest at 1 shilling each. How much was taken for the tickets?
3. A motorist, travelling at 36 m.p.h., left Town A, for Town B. At the same time, a cyclist, travelling at 12 m.p.h., left Town B for Town A. Town A is 168 miles from Town B. How far apart were the travellers after $2\frac{1}{2}$ hours?
4. At a sale, all clothing was reduced by 2s. in the £. If a suit was sold for £8 11s., what was the original price?
5. A tank weighs $49\frac{1}{2}$ lb. when $\frac{3}{4}$ full of water. The weight of the tank, alone, is 12 lb. If 1 pint of water weighs $1\frac{1}{4}$ lb., how many gallons does the tank hold, when full?

INTELLIGENCE QUESTIONS

1. Choose the odd word in each line :
   (*a*) Apple, pear, fruit, peach, plum, strawberry.
   (*b*) elm, ash, oak, tree, poplar.
   (*c*) tea, cocoa, beverage, coffee, chocolate.
   (*d*) trumpet, instrument, violin, 'cello, flute.
   (*e*) hammer, tool, plane, chisel, pliers.
   (*f*) tulip, rose, poppy, dahlia, flower.
2. Jane and June like tennis. Mary and May like netball and swimming. May and Jane like hockey. June likes swimming. Who likes :
   (*a*) Swimming and netball?
   (*b*) Hockey and tennis?
   (*c*) Tennis and swimming?
   (*d*) Which girl enjoys three games?
3. Choose the best word from the bracket, to complete these :

(*a*) All schools have —— (laboratories, fields, maps, pupils).
(*b*) All cars have —— (petrol, wheels, heaters, mirrors).
(*c*) All gardens must have —— (rakes, scythes, soil, roses).
(*d*) All games have —— (balls, courts, pitches, rules).

4. Four towns are situated thus :

A is 30 miles West of B; C is 8 miles East of B; and D is 12 miles East of A.

(*a*) How many miles from A to C?
(*b*) How many miles from D to B?
(*c*) In which direction do you travel from D to C?
(*d*) In which direction do you travel from C to A?

5. Rearrange these letters to make animal names :

(*a*) fearigf; (*b*) poerdal; (*c*) neisosl; (*d*) tnaoeelp; (*e*) tnpleeha; (*f*) gtrie.

6. Complete the following :

(*a*) House is to man as nest is to ——.
(*b*) Penny is to halfpenny as shilling is to ——.
(*c*) Shoe is to foot as glove is to ——.
(*d*) Morning is to evening as dawn is to ——.
(*e*) Garden is to spade as field is to ——.

ENGLISH

1. Read the following, then answer the questions :

"My father had a small estate in Nottinghamshire; I was the third of five sons. He sent me to Emmanuel College in Cambridge at fourteen years old, where I resided three years, and applied myself close to my studies; but the charge of maintaining me (although I had a very scanty allowance) being too great for a narrow fortune, I was bound apprentice to Mr. James Bates, an eminent surgeon in London, with whom I continued four years. . . ."

Gulliver's Travels, Swift.

(*a*) How many brothers had the story-teller?
(*b*) Did he work hard in college? Which phrase tells you?
(*c*) Was his father a wealthy man?
(*d*) What does "eminent" mean?
(*e*) How old was the writer when he left Mr. James Bates?

2. Rewrite these sentences in the past tense :

(*a*) We are sorry that you cannot come.
(*b*) I am sure we shall win.
(*c*) The game is finished and we can go home.
(*d*) I know you are wrong.
(*e*) I hear the crack of the whip as the trainer teaches his animals.
(*f*) We sing a song as we march along.

3. Form VERBS from the following :

(*a*)	terror	(*g*)	courage
(*b*)	consumption	(*h*)	joy
(*c*)	electric	(*i*)	choice
(*d*)	comfortable	(*j*)	necessary
(*e*)	practice	(*k*)	friend
(*f*)	prison	(*l*)	prescription

4. Name the shopkeepers who sell these things :

(*a*) Pencils, writing paper, envelopes, notebooks.

(*b*) newspapers and magazines.
(*c*) ladies' hats.
(*d*) socks and stockings.
(*e*) sweets and chocolates.
(*f*) flowers.

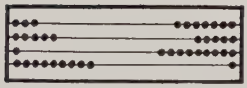
5. Arrange each group of words in alphabetical order :

(*a*) Clutch, blanket, address, coin, block, adhere.
(*b*) major, lean, isle, mallet, lone, island.
(*c*) saloon, salute, sacred, sale, sail, sample.
(*d*) guardian, groove, guile, gymnast, grind, guard.
(*e*) post, possible, portrait, postpone, possess, porridge.
(*f*) draught, drama, drake, dread, drastic, dream, drawbridge.

6. Choose the correct word from the bracket :

(*a*) Botany is the study of (fish, rocks, plants, maps).
(*b*) The wearing away of rock, by the weather, is called (eruption, erosion, erasure, exemption, excavation).
(*c*) Lack of rainfall over a long period is called a (draught, famine, drought, draft).
(*d*) A man guilty of treason is a (tyrant, prisoner, treasurer, traitor).
(*e*) Young chicks are hatched in an (incubator, indicator, hatchway, invigilator).

TEST 6



MECHANICAL ARITHMETIC

Work as quickly as you can.

1. Add
14
12
26

2. Subtract
4,382
1,291

3. Multiply
2,721
7

4. Divide
8)1,936

5. Add

£	s.	d.
3	12	$8\frac{1}{2}$
2	10	$4\frac{1}{2}$

6. Subtract

£	s.	d.
29	7	4
31	12	7

7. Add

lb.	oz.
4	6
5	8
2	7

8. Multiply

hr.	min.	sec.
3	15	12
		5

9. Divide
12)5,212

10. Divide

£	s.	d.
5)27	13	9

11. Add

gal.	qt.	pt.
6	2	1
3	3	1
5	2	1

12. Multiply
178
25

13. Add

£	s.	d.
7	12	$6\frac{1}{2}$
2	0	11
5	18	$2\frac{1}{2}$

14. Subtract

yd.	ft.	in.
12	0	3
7	1	$4\frac{1}{2}$

15. Subtract

ton	cwt.
31	6
17	11

16. Multiply

£	s.	d.
12	7	$4\frac{1}{2}$
		8

17. Divide

gal.	qt.	pt.
5)36	3	1

18. Add

ton	cwt.	st.
3	7	4
2	12	5
3	4	6

19. Divide

yd.	ft.	in.
11)58	2	11

20. Divide

£	s.	d.
41)49	12	$6\frac{1}{2}$

21. Add

ml.	yd.
4	850
1	910
3	300

22. Multiply

cwt.	lb.
3	15
	10

23. Subtract

hr.	min.	sec.
4	38	40
2	40	51

24. Multiply

387

425

25. Multiply

£	s.	d.
8	14	$10\frac{1}{2}$
		31

MENTAL ARITHMETIC

1. What is $\frac{1}{12}$ of 5,916?
2. 28×400.
3. 63 sq. in. $\div$ 9.
4. 63 sq. in. $\div$ 9 in.
5. 63 sq. in. $\div$ 9 sq. in.
6. Dividing a number by 10, I get a remainder of 7. What would be the remainder if I divided by 5?
7. 6 score of eggs at 5d. each. How much is this?
8. Five yards of ribbon cost 3s. 9d. What will 4 yd. cost?
9. A car, travelling at 45 m.p.h. does a journey of 30 miles. How long does it take on the road?
10. 1 lb. 13 oz. at 1s. 4d. per lb. Find the cost.
11. How much would it cost to carpet a floor 15 ft. $\times$ 12 ft. at 10s. per sq. yd.?
12. A square plot of ground has an area of 100 sq. yd. What is its perimeter?
13. 241 articles at $6\frac{1}{2}$d. each. How much is this?
14. I have read $\frac{2}{5}$ of my book and still have 63 pages to read. How many pages are there in my book?
15. $\frac{5}{6}$ of a pole is painted red. Half of the remainder is painted white. A length of 2 ft. is unpainted. How long is the pole?
16. 6 men take 3 days to do a piece of work. How long will it take one man to do half this work?
17. If coal is delivered in sacks weighing $1\frac{1}{4}$ cwt., how many sacks will be used to deliver $2\frac{1}{2}$ tons?
18. Harry loses $\frac{4}{7}$ of his marbles and has 21 left. How many did he start with?
19. A boy thinks of a number, halves it, multiplies by 5 and adds 10. His answer is 40. What was his original number?
20. Write in figures:
(*a*) XIX; (*b*) XXI; (*c*) XIV; (*d*) CVII.

PROBLEMS

1. At a concert, 62% of the audience were women. If there were 96 more women than men, how many were present altogether?

2. A motorist has $2\frac{1}{2}$ gallons of petrol in his car. The car travels 28 miles per gallon. If he has a journey of 217 miles to travel, how many more gallons will he need?

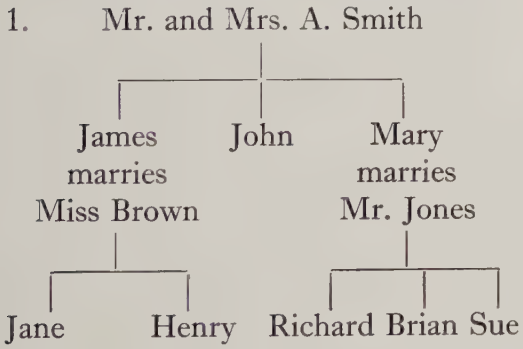
3. In an election, A received twice as many votes as B, whilst C received three times as many votes as A. If 63,216 votes were registered, how many votes did A receive?

4. At a summer fête tea was sold at 4d. per cup and sandwiches were sold at 9d. each. If 169 cups of tea were sold and the total takings were £7 8s. 7d, how many sandwiches were sold?

5. A farmer's 2-acre field is rectangular in shape and has a side of 80 yd. How many yards of fencing will he need to enclose it? (4,840 sq. yd. = 1 acre.)

INTELLIGENCE QUESTIONS

1.



Here is the family tree of Mr. and Mrs. Smith. From it, answer these questions.

(*a*) What relation is Mrs. A. Smith to Brian?

(*b*) What relation is Henry to Richard?

(*c*) What is Brian's surname?

(*d*) What relation is Mrs. J. Smith to Sue?

(*e*) How many nephews has John?

2. A, B, C, D and E stood in a row. C was in front, D was last. B stood between A and E, looking at A's back.

(*a*) Who is in the middle?

(*b*) How many are between C and E?

(*c*) How many between B and C?

(*d*) Who is behind E?

3. Which words stand for the smallest and greatest in these lists?

(*a*) Yard, inch, mile, foot, chain.

(*b*) Pound, ounce, stone, hundredweight, ton.

(*c*) Youth, child, adult, infant, adolescent.

(*d*) Page, chapter, book, word, library.

(*e*) Country, county, town, village, dwelling.

(*f*) Kettle, barrel, cup, teapot, pail.

4. Dick is tall and wears glasses. John wears glasses and is short and fat. Henry is fat and short. Jim is short, thin and wears glasses. Bill is tall and thin but does not wear glasses.

Who would be your companion if you went out with:

(*a*) A short, fat boy, wearing glasses

(*b*) A tall boy with glasses?

(*c*) A short fat boy with perfect eyesight.

(*d*) A short, thin boy, wearing glasses.

5. Which word does not belong with the others in each of these lines:

(*a*) Prince, king, man, woman.

(*b*) Mice, rabbits, cat, rats.

(*c*) Head, cap, beret, hat.

(*d*) Rug, floor, carpet, mat.

(*e*) Idle, lazy, slack, late.
(*f*) Morning, noon, day, evening.
(*g*) Jill, Jack, Jane, Joan.
(*h*) Diamond, ruby, pearl, emerald.

6. The typewriter spacing needs attention ! Can you read this ?

YO UHA VENO WCOMP LE TEDT HEL ASTEX ERC IS EINT HI SSE RIE S.

ENGLISH

1. Read carefully and then answer the questions.

"The road along which he travelled was scarce as populous as most other roads in the kingdom, and far less so than those which lie between the larger towns. Yet from time to time Alleyne met other wayfarers, and more than once was overtaken by strings of pack-mules and horsemen journeying in the same direction as himself. Once a begging friar came limping along in a brown habit, imploring him in a most dolorous voice to give him a single groat to buy bread wherewith to save himself from impending death."

The White Company, Conan Doyle.

(*a*) Was Alleyne on a main highway ?
(*b*) Which word is used instead of "travellers" ?
(*c*) Is this tale of recent times ?
(*d*) What might be the cause of the friar's death, according to his story ?
(*e*) Which word, in the passage, means "to entreat" or "to ask over and over again" ?
(*f*) What money is mentioned ?

2. Change the following sentences from INDIRECT to DIRECT speech :

e.g. Mary said that it was two o'clock.
"It is two o'clock," said Mary.

(*a*) The small boy asked his mother if he could play in the park.
(*b*) The customer complained that she had been waiting ten minutes before being served.
(*c*) John's Mother told him to close the door.
(*d*) Tom said that he would be at the station at four o'clock.
(*e*) Mrs. Brown thanked Jane for her help and said she was very grateful.
(*f*) The announcer stated that the next train from platform seven would leave at 2.10 p.m.

3. Form ADJECTIVES from these words :

(*a*) include.	(*g*) volcano.
(*b*) injure.	(*h*) neglect.
(*c*) length.	(*i*) describe.
(*d*) fame.	(*j*) luxury.
(*e*) expense.	(*k*) imagine.
(*f*) industry.	(*l*) vanity.

4. (i) Complete these with the appropriate sound :

e.g. Lions roar.

(*a*) lambs ——	(*d*) horses ——
(*b*) doves ——	(*e*) sparrows ——
(*c*) owls ——	(*f*) snakes ——

(ii) A young cat is called a kitten. What are the young of these called ?

(*a*) lion.	(*d*) horse.
(*b*) goat.	(*e*) hare.
(*c*) cow.	(*f*) swan.

5. Write the plural form of the following :

(*a*) galley.	(*d*) coat-of-mail.
(*b*) woman.	(*e*) spoonful.
(*c*) fish.	(*f*) banjo.

(*g*) ox.
(*h*) daughter-in-law.
(*i*) hoof.
(*j*) man-o'-war.

6. Complete the following sentences with words suggested by the sentence in brackets.

(*a*) The soldier was armed —— (He was completely armed).
(*b*) Everything is above —— (Everything is perfectly straightforward and honest).
(*c*) Tom is a chip —— (Tom is very like his father).
(*d*) We must strike while the iron —— (We must act without delay).
(*e*) At the beginning of the New Year she decided to turn —— (She decided to make a fresh effort).

ANSWERS TO THE SELECTION TESTS

TEST 1

ARITHMETIC

Mechanical.—1. 107. *2.* 3,454. *3.* 1,100. *4.* 229. *5.* 1,728. *6.* £3 16s. 10d. *7.* 57,861. *8.* 38 ton 2 cwt. *9.* 412. *10.* £2 5s. 5d. *11.* 10 gal. 2 qt. *12.* 8 yd. 1 ft. 7 in. *13.* 3 st. 3 lb. *14.* £11 12s. 2d. *15.* 3 lb. 15 oz. *16.* 21 hr. 8 min. *17.* £71 8s. 2d. *18.* 165·1. *19.* 11 ton 9 cwt. 4 st. *20.* £7 14s. 10½d. *21.* 1,412. *22.* £9 3s. 7d. *23.* £234 5s. 11d. *24.* 21,112. *25.* £52 0s. 11½d.

Mental.—1. 58. *2.* 23. *3.* 2s. 8d. *4.* 5s. 9d. *5.* 23. *6.* 37. *7.* £2 10s. *8.* 5d. *9.* 35 m.p.h. *10.* Sunday. *11.* 3 ft. 9 in. *12.* 10 cwt. *13.* 9s. 0d. *14.* 24. *15.* 52 sq. in. *16.* 8s. 2d. *17.* 16. *18.* 5 yd. 1 ft. *19.* 18 and 36. *20.* 18.

Problems.—1. 1s. 6d. *2.* 46 m.p.h. *3.* 12. *4.* 3 ft. 6 in. *5.* 500 apples, 375 pears, 125 oranges.

INTELLIGENCE QUESTIONS

1. (*a*) 2; (*b*) 6; (*c*) 4. *2.* (*a*) FOOD; (*b*) PENNY; (*c*) UJGGR; (*d*) GNGRJCPV. *3.* (*a*) 130 ml.; (*b*) WEST. (*c*) 70 ml. *4.* (*a*) FRYING TONIGHT 6 P.M.; (*b*) 15 min.; (*c*)

5. (*a*) Carpet; (*b*) trumpet; (*c*) sing; (*d*) grass. *6.* (*a*) Mary; (*b*) James; (*c*) Sue; (*d*) Alice.

ENGLISH

1. (*a*) Inmates; (*b*) Upon two chairs; (*c*) In a similar attitude; (*d*) She thought someone was missing; (*e*) Between the two men. *2.* (*a*) Bees; (*b*) cattle, buffaloes; (*c*) sparrows; (*d*) angels; (*e*) corn; (*f*) rooks; (*g*) clutch; (*h*) school; (*i*) gang; (*j*) pride; (*k*) bench; (*l*) cluster. *3.* (*a*) His or Her Royal Highness; (*b*) *Anno Domini* (in the year of Our Lord); (*c*) United Kingdom; (*d*) General Post Office; (*e*) North-East; (*f*) Church of England; (*g*) County or Company; (*h*) Elizabeth Regina, Eastern Region.

4. (*a*) We had bread and butter, jam, cakes, jelly and blancmange. (*b*) "May I go out at two o'clock?" asked Mary. (*c*) The dog, Rover, barked when he couldn't reach his bone. (*d*) "Help!" called the boy. "I'm falling." (*e*) The Queen Mary left Southampton and began her journey across the Atlantic Ocean to America. (*f*) "Where's my coat?" asked Jim. *5.* Daisies, journeys, sheep, teeth, shelves, cargoes, children, salmon, inches, loaves, enemies, watches. *6.* (*a*) Vehicles; (*b*) furniture; (*c*) liquids; (*d*) poultry; (*e*) insects; (*f*) vegetables; (*g*) metals; (*h*) relatives.

TEST 2

ARITHMETIC

Mechanical.—1. 1,020. *2.* 969. *3.* 24,438. *4.* 138. *5.* £10 6s. 11d. *6.* 33,355. *7.* 3,702. *8.* 5 hr. 24 min. *9.* 547·4. *10.* 5 lb. 7 oz. *11.* 24 ft. 2 in. *12.* 4 st. 5 lb. *13.* £4 17s. 7d. *14.* £33 16s. 3d. *15.* £18 15s. 10d. *16.* 39 gal. 1 qt. 1 pt. *17.* 13 yd. 7 in. *18.* 10 ft. 7 in. *19.* 20,755. *20.* 1 qr. 1 st. 12 lb. *21.* 263,296. *22.* £2 3s. 1d. *23.* £296 11s. 1½d. *24.* £51 18s. 7½d. *25.* 10 ml. 7 fur.

Mental.—1. 167. *2.* 100. *3.* 9s. 9d. *4.* 45. *5.* £2. *6.* 14s. 3½d. *7.* 31. *8.* 200. *9.* 1⅓. *10.* 1 hr. 25 min. *11.* 18. *12.* 18. *13.* 1680 and 1864. *14.* 5. *15.* 8. *16.* 5s. *17.* 120. *18.* 6s. *19.* 15 qt. *20.* 1961.

Problems.—1. 26 gal. 2 pt. *2.* 7 min. *3.* 5 ships. *4.* Tom £48, Peter £24, Harry £8. *5.* 10½d.

INTELLIGENCE QUESTIONS

1. (*a*) G; (*b*) N; (*c*) Q; (*d*) C; (*e*) I; (*f*) R. *2.* (*a*) 11, 13; (*b*) 21, 28; (*c*) 6, 5; (*d*) 128, 256; (*e*) 9, 10; (*f*) 18, 5. *3.* (*a*) Day; (*b*) dog; (*c*) 1,071; (*d*) first floor. *4.* Grilled steak, ham salad, fish and chips, sausages, cheese pie. *5.* (*a*) Skis; (*b*) patient; (*c*) lace; (*d*) arrow. *6.* (*a*) EGI, GIK; (*b*) CDDE, DEEF; (*c*) CXC, DWD; (*d*) G.J.I, J.M.L.

ENGLISH

1. (*a*) Fairies; (*b*) keep away and behave; (*c*) forked; (*d*) hence; (*e*) offence. *2.* (*a*) Actress; (*b*) bridegroom; (*c*) mayoress; (*d*) niece; (*e*) earl or count; (*f*) tigress; (*g*) wizard; (*h*) heiress; (*i*) hostess; (*j*) widower; (*k*) madam chairman. *3.* (*a*) I; (*b*) weren't; (*c*) swam; (*d*) I; (*e*) those; (*f*) has; (*g*) could. *4.* (*a*) 7; (*b*) 8; (*c*) 10; (*d*) 9; (*e*) 1; (*f*) 4; (*g*) 2; (*h*) 5; (*i*) 3; (*j*) 6. *5.* (*a*) Pianist; (*b*) compass; (*c*) submarine; (*d*) decade; (*e*) granary; (*f*) matron. *6.* (*a*) A needle; (*b*) an owl; (*c*) a hunter; (*d*) a rock; (*e*) a berry; (*f*) a feather; (*g*) rain; (*h*) gold.

TEST 3

ARITHMETIC

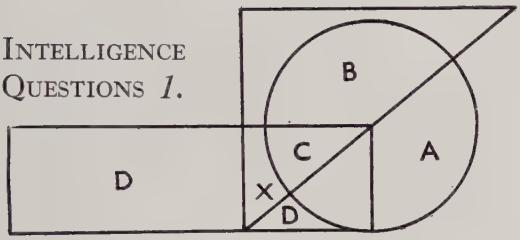
Mechanical.—1. 684. *2.* 7,018. *3.* 32,576. *4.* 95. *5.* 2,246. *6.* £3 13s. 3½d. *7.* 14 ft. 4 in. *8.* £2 3s. 2d. *9.* 10 gal. 1 pt. *10.* 15 hr. 46 min. *11.* £32 4s. 2d. *12.* 1 ml. 260 yd. *13.* 1 yd. 2 ft. 8 in. *14.* 8 ml. 1 fur. 9 ch. *15.* £7 5s. 11d. *16.* 17 ton 9 cwt. 4 st. *17.* 15 yd. 8 in. *18.* 701·8. *19.* 45. *20.* 23,688. *21.* 33 ton 16 cwt. 3 qr. *22.* £400 13s. 1½d. *23.* 68 yd. 2 ft. 3½ in. *24.* 1,519.

25. 7 st. 11 lb. 11 oz.

Mental.—1. 6,993. *2.* 1,125. *3.* 3·55. *4.* $\frac{7}{8}$. *5.* £1 9s. 10½d. *6.* 11 yd. 1 ft. *7.* £3. *8.* 6½ yd. *9.* 5 gal. *10.* 4. *11.* 102 lb. *12.* £2. *13.* 160 min. *14.* 8. *15.* 1s. 8d. *16.* 80. *17.* ½ ml. *18.* 2s. 9d. *19.* 24. *20.* 24 yd.

Problems.—1. 294 pkts. *2.* (*a*) 366 marks; (*b*) 61%; *3.* £11 8s. *4.* 4½ min. past 3. *5.* 30 m.p.h.

INTELLIGENCE QUESTIONS *1.*



2. (*a*) Christmas Day comes on the twenty-fifth of December; (*b*) Most children enjoy playing in rock pools. (*c*) The longest day of the year is in June. (*d*) Make hay while the sun shines. *3.* (*a*) 068930; (*b*) 5681; (*c*) 03868930; (*d*) LANE; (*e*) TIDAL; (*f*) CATTLE. *4.* (*a*) L; (*b*) T; (*c*) R; (*d*) G; (*e*) I. *5.* (*a*) Exit, entry; (*b*) wet, dry; (*c*) quiet, noisy; (*d*) arrive, depart; (*e*) below, above; (*f*) rich, poor; (*g*) dangerous, safe; (*h*) expand, contract. *6.* (*a*) 13; (*b*) 11; (*c*) 40.

ENGLISH

1. (*a*) Inmost recesses of her desk; (*b*) rumour; (*c*) Jenny Snow; (*d*) became friends again; (*e*) she offered the answers to some sums; (*f*) her close circle of friends. *2.* (*a*) Choice; (*b*) serenity; (*c*) proclamation; (*d*) heroic; (*e*) scientific; (*f*) anxiety. *3.* Agile—nimble, immense—massive, abandon—leave, fraudulent—dishonest, understand—comprehend, disaster—calamity, limpid—clear, rude—insolent, conceal—hide, loathe—detest, enthusiastic—keen, fatigue—weariness. *4.* (*a*) Meddle; (*b*) draught; (*c*) serial; (*d*) current; (*e*) dessert; (*f*) principal. *5.* (*a*) FERTILE; (*b*) ANONYMOUS; (*c*) RELUCTANT; (*d*) INAUDIBLE; (*e*) MARINER; (*f*) TRANSLUCENT; (*g*) ASSEMBLED; (*h*) ELOCUTION.

TEST 4

ARITHMETIC

Mechanical.—1. 146. *2.* 569. *3.* £7 10s. 5d. *4.* 301. *5.* £22 0s. 6d. *6.* 419. *7.* £5 0s. 11d. *8.* 5,400. *9.* 6 ton 9 cwt. *10.* 1,625. *11.* 2 st. 8 lb. *12.* 18 ft. 9 in. *13.* 7 min. 13 sec. *14.* 7 gal. 4 pt. *15.* 24,780. *16.* 18 lb. 7 oz. *17.* 4,414. *18.* 7 hr. 57 min. 6 sec. *19.* 2 ton 7 cwt. 12 lb. *20.* 22 yd. 6 in. *21.* 10 cwt. 5 st. *22.* £57 17s. 9d. *23.* 40. *24.* £259 4s. 4½d. *25.* 181,590.

Mental.—1. 20. *2.* 32. *3.* 25. *4.* 68 lb. *5.* £1 8s. 9d. *6.* 150,005. *7.* £3 7s. 3d. *8.* 70. *9.* 1s. 6d. *10.* 3s. 4d., 6s. 8d. *11.* 9 yr. *12.* 20. *13.* 3½ lb. *14.* 85 min. *15.* 36 sq. in. *16.* 6s. *17.* 20. *18.* 16. *19.* 270 min. *20.* 28.

Problems.—1. 8 doz. pairs. *2.* 4 ft. 6 in. *3.* 3s. *4.* 2s. 7d. *5.* £21.

INTELLIGENCE QUESTIONS

1. (i) (*b*), (*d*), (*a*), (*c*); (ii) (*d*), (*a*), (*c*), (*b*). *2.* (*a*) Tom; (*b*) Jane; (*c*) Harry; (*d*) Mary; (*e*) Dick; (*f*) Tom. *3.* (*a*) 10. (*b*) 11. (*c*) 210; (*d*) $\frac{4}{7}$. *4.* (*a*) Cart; (*b*) weak; (*c*) drink; (*d*) student. *5.* 50 yd. *6.* (*a*) J. E. MERRYWEATHER; (*b*) Area Manager; (*c*) No; (*d*) 40 hr.

ENGLISH

1. (*a*) House hunting; (*b*) summer;

(*c*) town; (*d*) at length; (*e*) very many or without number; (*f*) No. I carried her to *certain* of the hopefullest houses. . . . *2.* Bless—curse, wealth—poverty, disperse — assemble, temporary—permanent, stationary—mobile, ebb—flow, attract—repel, expand—contract, generous—mean, refuse—accept. captivity—freedom, coarse—fine. *3.* (*a*) Was; (*b*) sprang; (*c*) have; (*d*) sang; (*e*) have; (*f*) did. *4.* (*a*) Justice of the Peace; (*b*) leg before wicket; (*c*) On Her Majesty's Service; (*d*) Cash on Delivery; (*e*) United States of America; (*f*) Master of Arts; (*g*) Before Christ; (*h*) ante meridian (before noon). *5.* (*a*) Man's; (*b*) child's; (*c*) children's; (*d*) girls'; (*e*) men's; (*f*) ladies'. *6.* (*a*) Dough, sew; (*b*) caber, neighbour; (*c*) loose, goose; (*d*) loathe, clothe; (*e*) rim, hymn; (*f*) seize, bees; (*g*) tough, snuff.

TEST 5

ARITHMETIC

Mechanical.—1. 75. *2.* 148. *3.* £16 3s. 2d. *4.* 2,368. *5.* 4,746. *6.* 4,733. *7.* 316. *8.* 22 hr. 30 min. *9.* 3 st. 10 lb. *10.* 13 fur. 6 chn. *11.* 257,240. *12.* £5 17s. 11d. *13.* 4 gal. 1 qt. 1 pt. *14.* 23 hr. 15 min. *15.* 13 st. 7 lb. *16.* 1 ft. 5 in. *17.* 13 ml. 7 fur. *18.* £73 2s. 9½d. *19.* 18,050. *20.* 2 ton 15 cwt. 2 qr. *21.* £227 11s. 0½d. *22.* 558. *23.* £172 17s. 1½d. *24.* 524·9. *25.* 3,506.

Mental.—1. 9. *2.* ¾ ml. *3.* ¼, ⅓, ½, ⅚, 11/12. *4.* 12. *5.* £1 3s. 11d. *6.* 407. *7.* 5s. 6d. *8.* ¼ in. *9.* 10 yd. *10.* 324
11. £10 10s. *12.* 240. *13.* 266
12 gal. *14.* 5 st. 9½ lb. *15.* 473
48. *16.* 3d., 11d. *17.* 7⅓. 1,063
18. 70. *19.* 3s. 4d. *20.* £4.

PROBLEMS

1. 1½d. *2.* £47 10s. *3.* 48 ml. *4.* £9 10s. *5.* 5 gal.

INTELLIGENCE QUESTIONS

1. (*a*) Fruit; (*b*) tree; (*c*) beverage; (*d*) instrument; (*e*) tool; (*f*) flower. *2.* (*a*) Mary and May; (*b*) Jane; (*c*) June; (*d*) May. *3.* (*a*) Pupils; (*b*) wheels; (*c*) soil; (*d*) rules. *4.* (*a*) 38; (*b*) 18. (*c*) EAST; (*d*) WEST. *5.* (*a*) Giraffe; (*b*) leopard; (*c*) lioness; (*d*) antelope; (*e*) elephant; (*f*) tiger. *6.* (*a*) Bird; (*b*) sixpence; (*c*) hand; (*d*) dusk; (*e*) plough.

ENGLISH

1. (*a*) Four; (*b*) Yes, "and applied myself close to my studies." (*c*) No. (*d*) Notable, well known. (*e*) 21 years old. *2.* (*a*) We were sorry that you could not come. (*b*) I was sure we should win. (*c*) The game was finished and we could go home. (*d*) I knew you were wrong. (*e*) I heard the crack of the whip as the trainer taught his animals. (*f*) We sang a song as we marched along. *3.* (*a*) Terrify; (*b*) consume; (*c*) electrify; (*d*) comfort; (*e*) practise; (*f*) imprison; (*g*) encourage, discourage; (*h*) enjoy; (*i*) choose; (*j*) necessitate; (*k*) befriend; (*l*) prescribe. *4.* (*a*) Stationer; (*b*) newsagent; (*c*) milliner; (*d*) hosier; (*e*) confectioner; (*f*) florist. *5.* (*a*) Address, adhere, blanket, block, clutch, coin; (*b*) island, isle, lean, lone, major, mallet; (*c*) sacred, sail, sale, saloon, salute, sample; (*d*) grind, groove, guard, guardian, guile,

gymnast; (*e*) porridge, portrait, possess, possible, post, postpone; (*f*) drake, drama, drastic, draught, drawbridge, dread, dream. *6.* (*a*) Plants; (*b*) erosion; (*c*) drought; (*d*) traitor; (*e*) incubator.

TEST 6

ARITHMETIC

Mechanical.—1. 52. *2.* 3,091. *3.* 19,047. *4.* 242. *5.* £6 3s. 1d. *6.* £15 14s. 9d. *7.* 12 lb. 5 oz. *8.* 16 hr. 16 min. *9.* 434 rem. 4. *10.* £5 10s. 9d. *11.* 16 gal. 0 qt. 1 pt. *12.* 4,450. *13.* £15 11s. 8d. *14.* 4 yd. 1 ft. 10½ in. *15.* 13 ton 15 cwt. *16.* £98 19s. *17.* 7 gal. 1 qt. 1 pt. *18.* 9 ton 4 cwt. 7 st. *19.* 5 yd. 1 ft. 1 in. *20.* £1 4s. 2½d. *21.* 9 ml. 300 yd. *22.* 31 cwt. 38 lb. *23.* 1 hr. 57 min. 49 sec. *24.* 164,475. *25.* £271 1s. 1½d.

Mental.—1. 493. *2.* 11,200. *3.* 7 sq. in. *4.* 7 in. *5.* 7. *6.* 2. *7.* £2 10s. *8.* 3s. *9.* 40 min. *10.* 2s. 5d. *11.* £10. *12.* 40 yd. *13.* £6 10s. 6½d. *14.* 81. *15.* 24 ft. *16.* 9 days. *17.* 40. *18.* 49. *19.* 12. *20.* 19, 21, 14, 107.

Problems.—1. 400. *2.* 5¼ gal. *3.* 14,048. *4.* 123 sandwiches. *5.* 402 yd.

INTELLIGENCE QUESTIONS

1. (*a*) Grandmother; (*b*) cousin; (*c*) Jones; (*d*) aunt; (*e*) three. *2.* (*a*) B; (*b*) 2; (*c*) 1; (*d*) D. *3.* (*a*) Inch, mile; (*b*) ounce, ton; (*c*) infant, adult; (*d*) word, library; (*e*) dwelling, country; (*f*) cup, barrel. *4.* (*a*) John; (*b*) Dick; (*c*) Henry; (*d*) Jim. *5.* (*a*) Woman; (*b*) cat; (*c*) head; (*d*) floor; (*e*) late; (*f*) day; (*g*) Jack; (*h*) pearl. *6.* You have now completed the last exercise in this series.

ENGLISH

1. (*a*) No; (*b*) wayfarers; (*c*) no; (*d*) starvation; (*e*) implore; (*f*) a groat. *2.* (*a*) "May I play in the park, Mother?" asked the small boy. (*b*) "I have been waiting ten minutes to be served," complained the customer. (*c*) "Close the door, John," said his mother. (*d*) "I shall be at the station at four o'clock," said Tom. (*e*) "Thank you for your help, Jane," said Mrs. Brown. "I am very grateful." (*f*) "The next train from platform seven, will leave at 2.10 p.m.," stated the announcer. *3.* (*a*) Inclusive; (*b*) injurious; (*c*) long, lengthy; (*d*) famous; (*e*) expensive; (*f*) industrious; (*g*) volcanic; (*h*) neglectful; (*i*) descriptive; (*j*) luxurious; (*k*) imaginary; (*l*) vain. *4.* (i) (*a*) Bleat; (*b*) coo; (*c*) hoot; (*d*) neigh; (*e*) chirp or chirrup; (*f*) hiss. (ii) (*a*) Cub; (*b*) kid; (*c*) calf; (*d*) foal; (*e*) leveret; (*f*) cygnet. *5.* (*a*) Galleys; (*b*) women; (*c*) fish, fishes; (*d*) coats-of-mail; (*e*) spoonfuls; (*f*) banjos; (*g*) oxen; (*h*) daughters-in-law; (*i*) hoofs, hooves; (*j*) men-o'-war. *6.* (*a*) To the teeth; (*b*) board; (*c*) of or off the old block; (*d*) is hot; (*e*) over a new leaf.

Scripture

EVER since men have lived on the earth they have felt that beyond the world there was a God who had made it and created them, and they have wanted to serve Him. Often their beliefs were childish and superstitious, but they glimpsed something of the truth. Men have believed in many religions since the world began, but Christians believe that the full truth about God was not revealed until the Son of God Himself became a Man, and was born into the world as Jesus Christ to teach us God's way, to free us from our sins, and to institute His Church to continue His work and teaching after He had left, so that when we die we may be worthy to dwell with God for ever in Heaven.

The story of Jesus is told in a wonderful book called the Bible. One day you should read it all, but here are a few short stories from the life of Jesus. They are chosen from what are called the Gospels (the "Good News") of St. Matthew, St. Mark, St. Luke and St. John. You will find these Gospels in the second part of the Bible, called "the New Testament."

An angel tells Mary that the Son of God will be born to her.

(1)

JESUS THE CHILD

In the days when Augustus ruled the Roman Empire, and King Herod governed for the Romans in the land we now call Israel, there lived in Judaea a priest named Zacharias and his wife Elizabeth. They were growing old and had no children, but in the Temple at Jerusalem an angel appeared to Zacharias and said, "I am Gabriel. I stand in the Presence of God, and have been sent to tell you that your prayers have been heard. You will have a son, and call him John. He will prepare the people for the coming of the Lord." "How shall I know this is true?" replied Zacharias. "You will be struck dumb until it happens," answered the angel; and Zacharias found that he was unable to speak.

Six months later, in the little hill town of Nazareth in the north of Israel, the Archangel Gabriel appeared to Mary, Elizabeth's cousin, who was about to be married to Joseph the carpenter. "Mary," said Gabriel gently, "you have pleased God. The Holy Spirit will come upon you, the Power of the Highest will overshadow you, and you will bring forth a Son and name Him Jesus. Your child shall be called the Son of God." Also to Joseph he said, "Mary will bear a Son, and you must name Him Jesus, for He will save His people from their sins."

Mary went to visit Elizabeth, and they rejoiced together; and Mary sang the hymn we call "The Magnificat": "My soul doth magnify the Lord. . . ." When Elizabeth's baby was born, Zacharias wrote his name on a tablet—John; and immediately he was able to speak again and praised God in the "Benedictus": "Blessed be the Lord God of Israel, for He hath visited and redeemed His people!"

Soon after Joseph and Mary were married, the Emperor Augustus decreed that every man should go to his birthplace and register his name for taxing. So Joseph went with Mary to Bethlehem. It was a long journey, and when they arrived Mary was very tired, for it was nearly time for her baby to be born. But the inn was full, and there was nowhere to sleep except in the stable. There, that night, the baby was born, and Mary wrapped Him in baby clothes and laid Him in the manger.

Jesus in the manger.

The shepherds worship Jesus.

In the fields outside Bethlehem shepherds were guarding their sheep when a light suddenly shone round them, and an angel called : "I bring you good tidings of great joy which shall be to all people. For unto you is born this day in the city of David a Saviour, which is Christ the Lord." Then a host of angels appeared, singing, "Glory to God in the highest, and on earth peace, goodwill toward men." When the angels had gone, the shepherds ran to Bethlehem and found the stable with Mary and Joseph and the baby Jesus.

Later, wise men came to King Herod at Jerusalem, saying, "Where is He Who is born King of the Jews? For we have seen His star, in the East, and have come to worship Him." The priests of the Jews told Herod that the prophets of old had said that the Saviour-King (the Messiah) whom God would send would be born in Bethlehem, so he sent the wise men there, saying, "When you have found Him, come back and tell me." As they went, the wise men saw again the star which went before them until it stood over a house. They entered and saw the young child with Mary His mother and fell down and worshipped Him. Then they gave Him gifts—gold, frankincense and myrrh. But God warned them in a dream not to return to Herod, so they went home another way. Joseph also was warned to flee with Mary and Jesus by night to Egypt. Then Herod, when he found that the wise men had not returned to him, sent soldiers to kill all the children under two years old in Bethlehem.

(2)

JESUS PREPARES FOR HIS WORK

Joseph and Mary stayed in Egypt till they heard that Herod had died. Then they returned to Nazareth, where Jesus grew up and learned to be a carpenter like Joseph. Every year Mary and Joseph went up to Jerusalem for the Feast of the Passover, and when Jesus was twelve He went with them. He spent His time in the Temple listening to the teachers of religion and asking them questions. He was so interested that when Joseph and Mary started for home He stayed behind, and they did not miss Him till the end of the day's journey. They quickly returned and found Him in

THE WISE MEN WORSHIP JESUS AND OFFER HIM GIFTS

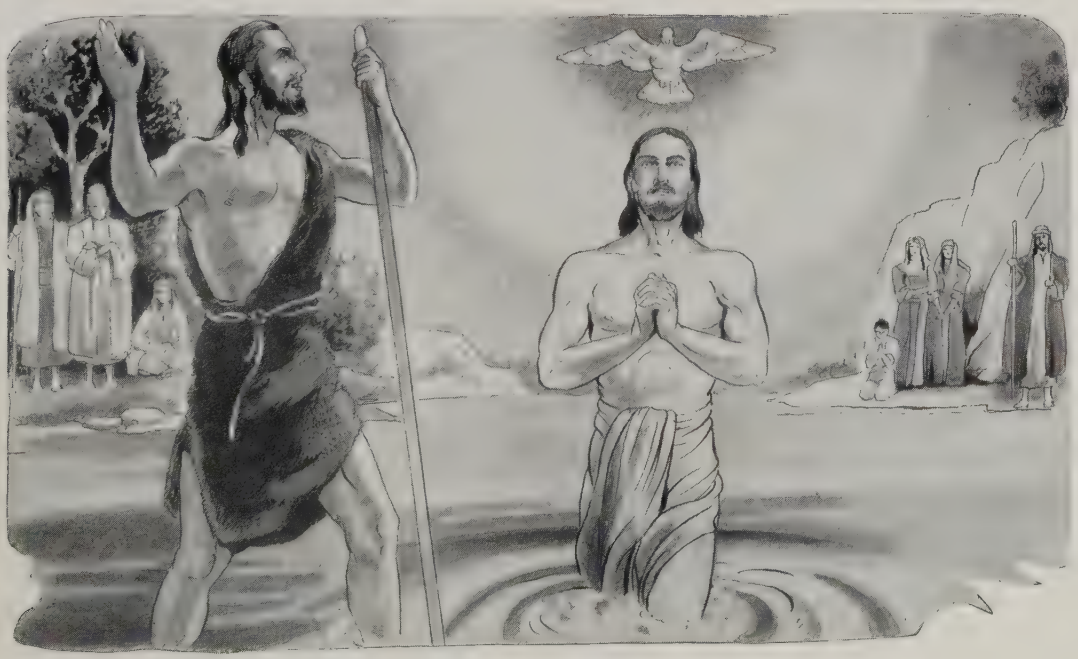
JESUS AS A BOY HELPS JOSEPH IN HIS CARPENTER'S WORKSHOP

the Temple. "Son, your father and I have been trying to find you. We have been very worried and anxious," His mother said. "But why?" replied Jesus. "Did you not know that I must be busy about the things that belong to my Heavenly Father?"

Jesus lived at Nazareth until He was about thirty years old. Since Joseph is not mentioned again, he probably died when Jesus was quite young, and Jesus remained at Nazareth, working as a carpenter. But when He was nearly thirty, Jesus heard that John the Baptist, the son of Zacharias and Elizabeth, was proclaiming: "The Kingdom of Heaven is near. Repent and be baptized for the remission of your sins! One mightier than I comes. He will baptize you with the Holy Spirit."

The crowds flocked to John, confessing their sins, and were baptized in the River Jordan. This was the moment for which Jesus had been waiting, and He came to John, and was baptized. Immediately, the Spirit descending like a dove rested on Him, and a voice from Heaven said, "This is My Beloved Son in Whom I am well pleased."

After His baptism, Jesus went into the wilderness, driven by the Spirit which was in Him. There He was tested. For forty days and nights He was without food. Then the Devil said to Him: "If You are the Son of God, command that these stones be made bread." "It is written in the Bible," Jesus replied, " 'Man shall not live by bread alone, but by every word which comes out of the mouth of God.' " Then Jesus saw Himself on a high tower of the Temple. "If You are the Son of God," said the tempting voice, "throw yourself down. For it is



Jesus is baptized by John the Baptist in the River Jordan.

written, 'Angels shall bear You up in their hands.'" "It is also written," Jesus answered, "'You shall not test the Lord your God.'" Finally the Devil said: "I will give You all the kingdoms of the world, if You will worship me." Jesus replied: "Go away, Satan. For it is written: 'You shall worship the Lord, your God, and Him only shall you serve.'" Then the Devil left Him.

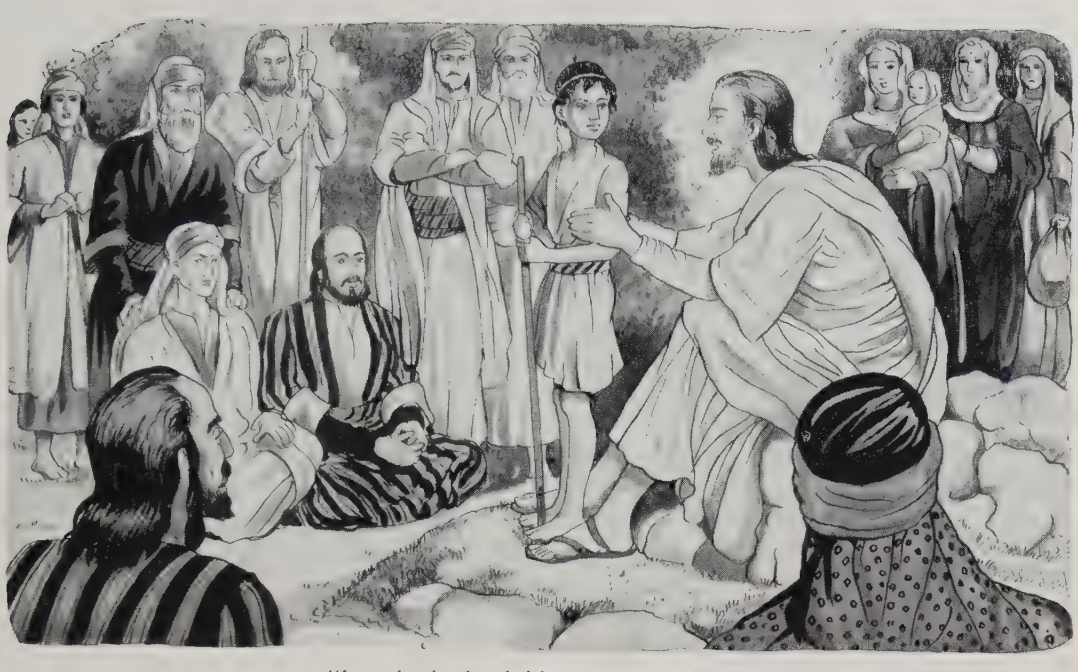
As Jesus returned from the wilderness, John the Baptist and two of his disciples, Andrew and John, saw Him walking by. The Baptist said to them, "Behold, the Lamb of God!" and they followed Jesus. Andrew told his brother Simon, "We have found the Messiah!" and brought him to Jesus, who called him "Peter," "the Rock." The next day Jesus called Philip, and Philip brought Nathanael. Three days later He went back to Galilee, and soon many were following Him. He made His home at Capernaum by the Sea of Galilee, where the disciples worked as fishermen with James, John's brother. But one day Jesus called to them, "Follow Me, and I will make you fishers of men." Then they left their nets and became His constant companions. At Capernaum also Jesus called Matthew who collected taxes at the quay-side, and he left all and became a disciple. Later, when John the Baptist had been imprisoned and beheaded, and plots were being laid against Jesus Himself, He chose twelve of His disciples and called them "apostles," or "men sent out as messengers." They were Simon Peter and Andrew his brother; James and John, his brother; Philip and Bartholomew; Matthew and Thomas, called Didymus; James, the son of Alphaeus, and Lebbaeus Thaddeus; Simon, the Zealot; and Judas Iscariot. To them He explained privately whatever they found puzzling in His teaching to the crowds.

(3)

JESUS IN HIS MINISTRY

Healing the sick.

For about three years Jesus journeyed on foot with his apostles throughout Israel. Every day was filled with teaching to the crowds who gathered around Him, and healing the sick. For He healed with a word or a touch the crippled, the blind, the deaf, the dumb, the lame, the paralysed, the epileptics, the ill in mind, and even the lepers, and He raised to life again some who were dead.



"Let the little children come to Me."

The more His apostles lived with Jesus, the more sure they were that He was the One sent by God to save the world. At Caesarea Philippi Jesus asked them, "Whom do men say that I am?" They replied, "John the Baptist, Elijah, Jeremiah or one of the prophets." "But whom do you say that I am?" Simon Peter answered : "You are the Christ, the Son of the living God." Then Jesus said : "You are Peter, and upon this rock I will build My Church, and the gates of Hell shall not prevail against it." And He told His apostles that He must go to Jerusalem to suffer and be killed, but that He would rise again on the third day. "If any man will come after Me," He added, "Let him take up his cross and follow Me."

Six days later Peter, James and John were with Jesus on a high mountain when they saw Him transfigured before them. His face shone like the sun and his robe as the light; and Moses and Elijah appeared, talking to Him. A bright cloud surrounded them and a voice said : "This is My Son, the Beloved in Whom I delight. Hear Him." The disciples fell on their faces, and when they looked up, saw only Jesus.

One evening little children were brought to Jesus so that He should lay His hands upon them and pray. The disciples would have stopped them, but Jesus said : "Let the little children come to Me. Do not stop them; for of such is the kingdom of Heaven. Whoever shall not receive the Kingdom of God like a little child shall not enter it." And He took them up in His arms, laid His hands on them and blessed them.

Towards the end of the three years Jesus told the apostles that the time

Children picking palm branches.

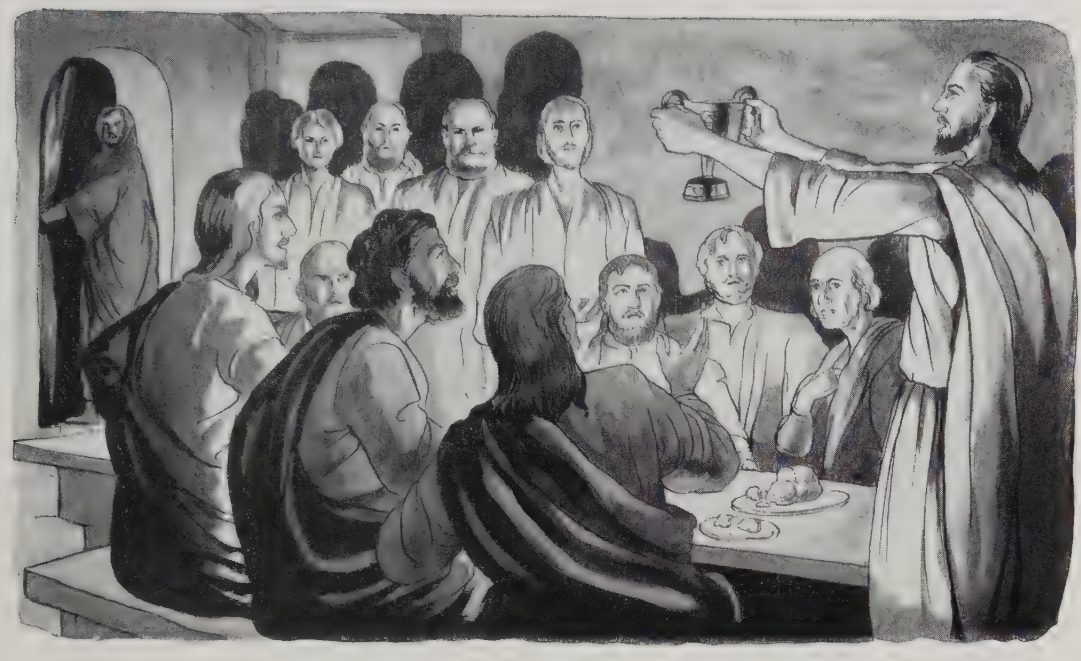
had come for Him to go to Jerusalem to face His death. Three times on the way He told them plainly that He must suffer and die, and rise again. Then, on the first day of His last week (our Sunday) Jesus rode into Jerusalem on an ass amid a triumphal procession of pilgrims. Some spread their cloaks in the way; others cut down branches from the palm trees and put them on the road, and they shouted : "Hosanna to the Son of David !" There were children also in the crowd, shouting, "Hosanna." Jesus went into the Temple and drove out those that bought and sold in it, saying : "It is written, 'My house shall be called the house of prayer'; but you have made it a den of thieves." Then the blind and the lame came to Him in the Temple.

(4)

JESUS CRUCIFIED

On the Wednesday, Jesus said : "In two days time it is the Feast of the Passover. The Son of Man is going to be betrayed and crucified." Then Judas Iscariot went to the chief priests and asked : "What will you give me if I deliver Him to you?" They said : "Thirty pieces of silver." Then, on the last evening, the Thursday, Jesus sat down with the twelve in an upper room in Jerusalem for supper. Suddenly He exclaimed, "One of you will betray Me !" Each of them cried in turn, "Lord, is it I ?" Jesus turned to Judas and said : "What you are going to do, do quickly !" Judas went out immediately. Then, as they were eating, Jesus took bread and blessed it, broke it in pieces and gave it to His disciples saying : "Take, eat; this is My body which is given for you. This do in remembrance of Me." After supper He gave the cup to them, and said : "Drink of it—all of you. For this is My blood of the New Covenant. This do, as often as you drink it, in remembrance of Me."

As they went out towards the Mount of Olives, Peter said, "Lord, where are You going ? I am ready to go with You



The Last Supper—"This is My blood."

to prison or to death." Jesus replied, "I go where you cannot follow Me now; but you shall do so later. But I tell you that this night, before the cock crows, you will deny Me three times!" Peter protested, "Lord even if I should die with You, I will not deny You." Then they came to the Garden of Gethsemane, where Jesus went apart from the disciples who lay down and were soon asleep. Jesus prayed in agony, "Oh, my Father, if it be possible, let this cup pass from Me. Nevertheless, not as I will, but as Thou wilt." Three times He prayed, and the sweat rolled down His face, like great drops of blood. Finally He said, "Oh my Father, if this cup may not pass away except I drink it, Thy will be done." Then He woke the sleeping disciples, calling, "Rise up! The hour has come." At that moment Judas came and ran to Jesus calling "Master, Master!" and kissed Him. It was the sign he had given, and the soldiers seized Jesus. But Peter drew his sword and cut off the right ear of Malchus, servant of the High Priest. "Put up your sword, Peter!" commanded Jesus, and healed Malchus's ear. Then all the disciples forsook Him and fled.

Jesus was taken before the Jews' High Court, the Sanhedrin, but they could find no charge on which to put Him to death, until Caiaphas the High Priest said, "Are You the Christ, the Son of God?" "I am," replied Jesus. At that the High Priest cried, "Do we need any other witnesses? You have heard this blasphemy from His own mouth!" They then condemned Him to death.

Early in the morning (of our "Good Friday"), the Jewish authorities brought Jesus to Pilate, the Roman

The Crucifixion—Jesus hangs between two thieves.

Governor, accusing Him of claiming to be the King of the Jews, and demanding his execution. Pilate examined Him privately, and Jesus replied, "I am a King, but My Kingdom is not of this world." Pilate sought some way of releasing Him. "You have a custom," he cried to the crowd, "by which I release to you a prisoner at the Passover. Shall I release Him?" The people shouted, "Not this man but Barabbas!" (Barabbas was a revolutionary.) The soldiers then took Jesus, beat Him, put a crown of thorns on His head, and a reed for a royal sceptre in His hand, threw round Him a royal-purple robe and mocked Him : "Hail, King of the Jews!" When Jesus came out, Pilate cried, "Behold the Man!" The people shouted, "Crucify Him, crucify Him!" Finally, Caiaphas the High Priest said to Pilate, "If you let this man go, you will be involved in treason against the Emperor." The people also called, "We have no King but Caesar. Away with Him! Crucify Him!" Then Pilate washed his hands before them, saying : "I am innocent of the blood of this good Man." And the soldiers put Jesus's own robe on Him and led Him away to crucify Him.

Jesus bore His own cross, but soon He stumbled under it, and they made a man from the crowd, Simon of Cyrene, carry it. At Calvary, the place of execution outside the city wall, they nailed Jesus to the cross. "Father forgive them," He cried, "For they know not what they do." They nailed His crime over His head—"King of the Jews," and hung Him up between two thieves. The people mocked : "If You are the Son of God, come down from the Cross!" One of the thieves said, "Lord, remember me

when You come into Your Kingdom." Jesus replied, "Today, you shall be with Me in Paradise." His mother stood with the apostle John at the foot of the Cross. "Son," said Jesus, "Look after her as your mother," and to Mary, "Mother, look on him as your son." Then John took Mary home. Suddenly, darkness came, though it was only mid-day, and Jesus cried, "My God, My God, why hast Thou forsaken Me?" . . . then, "I thirst." At about three o'clock Jesus called in triumph, "It is finished! Father into Thy hands I commend My Spirit," and He bowed His head and gave up His life.

Joseph of Arimathea gained permission from Pilate to take down the body of Jesus from the Cross, and buried Him in a little cave hewn from the rock in a nearby garden, and rolled a great rock to the mouth of the tomb. The Jews sealed it and set a guard of soldiers outside, to prevent anyone stealing the body.

(5)

JESUS VICTORIOUS

At dawn on the first day of the week (Easter Sunday) the women came to the tomb to embalm the body, and found the stone rolled away and the tomb empty. Mary Magdalene ran to tell the disciples. The other women were going away when they saw Jesus, and worshipped Him. Peter and John ran to the tomb and found the linen clothes lying there, and the napkin which had been round His head folded separately. Then they went away. Mary was left there alone, weeping. She saw through her tears one whom she thought must be the gardener, and said: "Sir, if you have taken Him from here, tell me where you have laid Him and I will take Him away." A voice she knew so well replied, "Mary!" and she flung herself at His feet, crying, "My Master!" "Don't cling to Me," said Jesus, "for I am not yet ascended to My Father."

That evening, two disciples were walking to Emmaus, a village about eight miles from Jerusalem, when One overtook them. "What are you talking

The empty tomb.

The Ascension—Jesus is carried up to Heaven.

about that makes you look so sad?" He asked. They told Him about the crucifixion of Jesus and the women's tales. He explained to them, from the Bible, that the Messiah had to suffer before He entered into Glory. When they reached the village, they asked Him to stay with them, and as they sat at supper, He took bread and blessed and broke it, and gave to them. Then they saw it was Jesus—and He vanished.

They hurried back to Jerusalem and told the apostles; and as they spoke, Jesus appeared and said: "Peace be unto you! As the Father sent Me, so send I you." Thomas Didymus was not there, and he said, "Except I see in His hand the print of the nails, and thrust my hand into His side, I will not believe." A week later, they were all together and the door was shut; and suddenly Jesus was there. He said to Thomas: "Reach hither your finger, and look at My hands." Thomas cried out: "My Lord and My God!" Jesus answered: "Because you have seen Me you have believed. Blessed are they who have not seen, and yet have believed."

For forty days Jesus was from time to time seen unexpectedly by the disciples. They knew now that whether they could see Him or not, He was always near. Finally, He met them upon a mountain, and said: "All power is given unto Me in Heaven and on earth. Go therefore and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost, teaching them to keep all the things which I have commanded you; and lo, I am with you always, even unto the end of the world."

Then He promised them the power and comfort of the Holy Spirit, and as He blessed them a cloud covered Him and began to ascend to the sky. As they watched, two men stood by them in gleaming white robes who said, "Why do you stand gazing up into Heaven? This same Jesus, who is taken up from you into Heaven, will come again, just as you have seen Him go into Heaven."

Ten days after the Ascension, they were praying together in Jerusalem when His promise was fulfilled. The sound of a rushing wind filled the house, tongues of flame fell on their heads, and they felt the Power of God's Spirit within them. It was Pentecost, the Jewish Harvest Festival, and Jerusalem was crowded. Peter went out and preached fearlessly to the crowds: "Jesus of Nazareth, Whom you crucified, and Whom God raised from the dead as we have all witnessed, is Lord and Christ. He has poured forth the Holy Spirit. Repent and be baptized, and you also shall receive the gift of the Holy Spirit." And that day three thousand believers were added to the Church.

(6)

THE GREAT DEEDS OF JESUS

JESUS was once preaching in the synagogue at Capernaum when a madman cried out: "I know Who You are. . . . The Holy One of God!" "Peace!" replied Jesus, then: "Come out of him." The man fell down in a fit, then rose, calm and sane, his mind healed. Jesus then went home to Peter's house and found Peter's mother-in-law ill with fever. He took her by the hand and the fever left her. That evening they brought to Him all that were diseased in mind and body, and He healed many.

A nobleman whose son was desperately ill in Capernaum came to Jesus at Cana and begged, "Sir, come down to Capernaum ere my child die." Jesus answered: "Go! Your son lives!" As the nobleman came near to Capernaum his servants met him with the news: "Your son is alive!" When he asked at what time the boy began to recover, they said: "Yesterday at one o'clock the fever left him." Then he

The Jewish nobleman.

remembered that that was the time when Jesus had spoken to him, and he and all his family believed.

A leper ran to Jesus saying : "If You will, You can make me clean." Jesus, moved with compassion stretched out His hand, touched him, and said : "I will. Be clean !" and immediately the leprosy was gone. Jesus asked, "Do not tell anyone, except the priest who will pronounce you healed"; but the man was so excited he told everyone.

As Jesus came to the town of Nain, a funeral procession met Him carrying the corpse of a young man, an only son, whose mother was a widow. Jesus was deeply moved and said : "Do not weep !" Then he touched the stretcher, and as the bearers stood still, called : "Young man, I say to you arise !" And he who had been dead sat up and began to speak.

Jairus, a ruler of the synagogue in Capernaum sought out Jesus and said : "My little daughter is dying. Come and lay Your hands on her and she shall live." But as they went towards his house, messengers came saying, "Your daughter is dead." Jesus said to Jairus : "Be not afraid. Only believe." They went into the house, and Jesus took the girl by the hand and called : "Talitha Cumi"—"Little girl, get up." And she got up and walked.

The boy with the loaves and fishes.

News was brought to Jesus that his friend Lazarus, brother of Martha and Mary, was very ill. Before Jesus reached Bethany he had died. "Lord," said Martha, "If You had been here my brother would not have died." "He shall rise again," Jesus answered, "I am the Resurrection and the Life; he who believes in Me shall never die." Mary came, and when they showed Him the grave, Jesus wept. Then He ordered them to remove the stone and prayed. "Lazarus," He called, "Come forth !" And Lazarus came out. Then many of the Jews believed that Jesus was the Messiah and told the Pharisees. The High Priest called a council which decided that it was better to put Jesus to death than have the whole nation disturbed because of Him.

One day, as evening drew near, the disciples said : "Send the crowds away so that they may buy food." "Give them food yourselves," Jesus answered. "But," replied Philip, "Where can we get food here ?" "There is a lad here who has five barley loaves and two small fishes," said Andrew, "but what are they among so many ?" "Get the people to sit down," Jesus com-

Jesus calms the storm on the Sea of Galilee.

manded. Then He took the loaves, gave thanks and distributed them to the disciples who gave them to the people; and afterwards the fishes. And though there were five thousand people, they all had enough and to spare, for when the disciples gathered the remains there were twelve baskets full.

One evening Jesus set sail across the Sea of Galilee. He was so tired that He quickly fell asleep on a pillow in the stern of the boat. Suddenly a violent storm arose, and the waves broke over the boat. The disciples were terrified and woke Jesus crying, "Lord, save us; we perish!" Jesus rose and called: "Peace, be still!" Then there was a great calm. Turning to His disciples, He said, "Why are you so full of fear? Where is your faith?" But they said to themselves: "What kind of a Man is this? Even the wind and the sea obey Him."

The most wonderful thing that Jesus did was to turn bad men into good men. Here is the story of one.

The people the Jews hated most were the tax-gatherers, for they did not care how much men and women suffered so long as they made themselves rich. The chief tax-gatherer in Jericho was a man named Zacchaeus. He was a little man, so when Jesus came to Jericho, Zacchaeus climbed into a tree to see Him. As Jesus passed, he looked up and saw him. "Zacchaeus," He said, "Come down, for today I will stay at your house." The people grumbled: "He has gone to be the guest of a man who is a sinner." But that evening as they ate together Zacchaeus was so moved that he said to Jesus: "Lord, the half of my goods I will give to the poor and repay fourfold anybody I have robbed."

(7)

JESUS THE TEACHER

BEFORE the teaching of Jesus, men were afraid of God. But He showed that God loves us and forgives us—as a father his children.

"There was a man who had two sons. The younger one went into a far country and wasted his wealth in wild living. Then the only work he could find was feeding pigs. He was so hungry he could have eaten the husks they ate; and he began to think about his father. He decided to return home and confess: 'Father, I have sinned against Heaven and before you, and am no more worthy to be called your son; make me one of your hired servants.' But when he was yet a long way off, his father saw him and ran and kissed him. The son began: 'Father I have sinned. . . .' But his father said to the servants: 'Bring the best robe, a ring for his finger and shoes for his feet. Kill the fatted calf. Let us eat and be merry. For this, my son was dead and is alive again; he was lost and is found.' Now the elder son was in the field, and when he came near the house he heard music and dancing, and one of the servants said, 'Your brother has come.' But he was angry and would not go in. When his father came out to beg him, he complained: 'I have been good and worked for you for all these years and you never gave me even a goat so that I could make merry with my friends. But this son of yours who has wasted your money—you have killed the

The Prodigal Son welcomed by his father on his return.

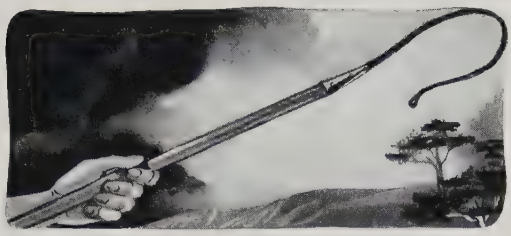
fatted calf for him.' 'Son,' replied his father, 'All that I have is yours! It is right that we should be glad, for this your brother was dead and is alive again; he was lost and is found.' "

Jesus told His disciples: "When you pray say: 'Our Father which art in Heaven, hallowed be Thy Name. Thy Kingdom come. Thy will be done on earth as it is in Heaven. Give us this day our daily bread. And forgive us our trespasses as we forgive them that trespass against us. And lead us not into temptation, but deliver us from evil: for Thine is the Kingdom, the power and the glory for ever and ever. Amen!' "

Always remember that in Jesus we see what God is like, and nothing is true about God's character which is not true about Jesus. "He who has seen Me," He said, "has seen the Father."

Because God loves us, Jesus said, we are not to be anxious. "Be not anxious about your life, or food or clothing. Look at the birds! They neither sow, nor reap, nor gather into barns; yet your heavenly Father feeds them. You cannot add to your height by worrying about it. And why are you worried about clothes? Think of how flowers in the field grow! Even King Solomon in all his glory was not dressed like one of these. Shall God not much more clothe you, Oh you of little faith? So do not worry, for your heavenly Father knows you need all these things. Seek first His Kingdom and what He tells you is right, and all these will be added."

Jesus Himself will guard and guide



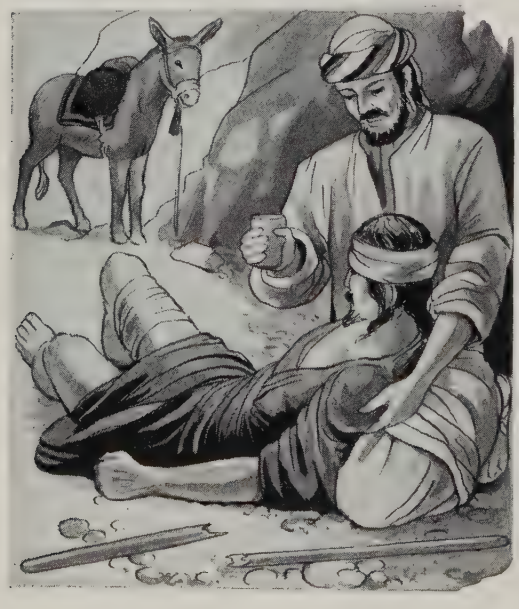
"I am the Good Shepherd."

us. "I am the Good Shepherd," He said. "The shepherd calls His own sheep by name and goes before them. The sheep follow Him for they know His voice. When the wolf comes, the man who only works for his hire leaves the sheep and flees; and the wolf catches the sheep. I am the Good Shepherd and know My sheep and am known of Mine, and I lay down My life for the sheep. Other sheep I have which are not of this fold. Them also I must bring, and they shall hear My voice, and there shall be one fold and one Shepherd."

As we have seen, Jesus did lay down his life . . . upon the Cross. That is why the Cross is the Christian sign. We can look at it and say to ourselves, "This is how much Jesus loved me. And this is how much God loves me." "For God so loved the world that He gave His only begotten Son, that whoever believes in Him should not perish, but have everlasting life. For God sent not His Son into the world to condemn the world; but that the world through Him might be saved."

The Christian way of life is based on love like that from us to all who are in need because they also are God's children. . . . A certain lawyer asked Jesus, "Master, what shall I do to

gain eternal life?" Jesus said to him, "What is the law?" He answered, "Thou shalt love the Lord thy God with all thy heart, and with all thy soul, and with all thy strength, and with all thy mind; and thy neighbour as thyself." Jesus replied, "Do this and you will live." "But who is my neighbour?" he queried. Jesus answered with this story: "A man going down from Jerusalem to Jericho was attacked by thieves who stripped him, wounded him, and went away leaving him half dead. By chance, a priest came down that way; and when he saw him he passed by on the other side. In the same way a Levite came and passed by on the other side. But a Samaritan saw him and had compassion on him; bound up his wounds, put him on his own ass, brought him to an inn, and took care of him. When he went away he paid the landlord and said: 'Take care of him; and whatever you spend more, I will repay you when I come again.' Which of these three was neighbour to him that fell among the thieves?" The lawyer answered, "He who showed kindness to him." Then Jesus said, "Go, and do the same."



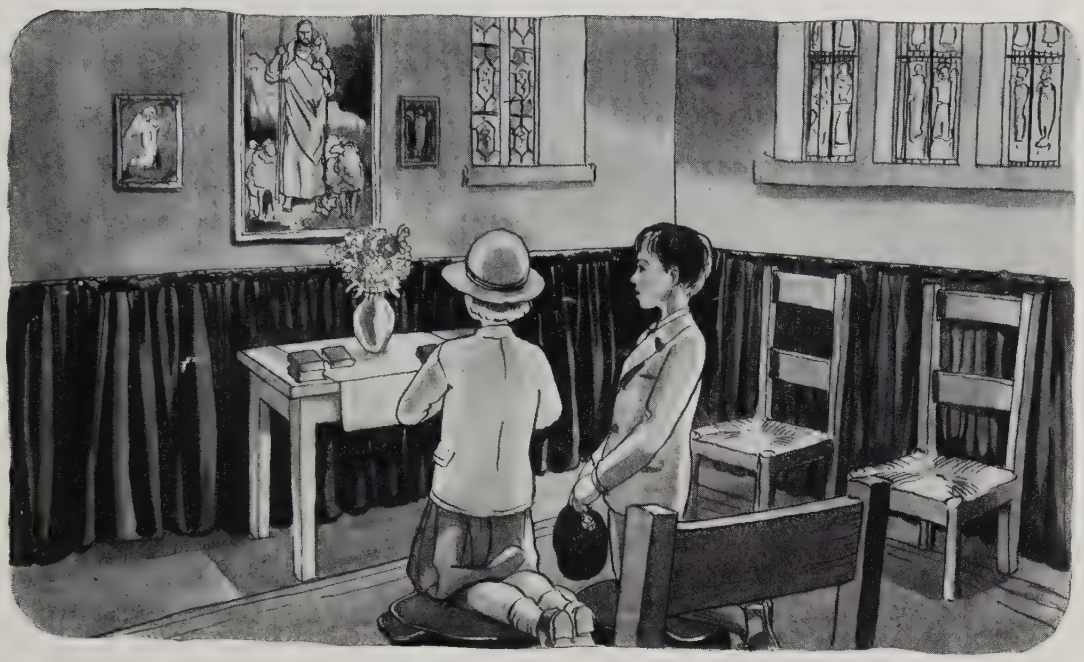
The good Samaritan.

Jesus gave his disciples a simple rule. "Do to others exactly what you wish they would do to you." "Love your enemies, and do good; and your reward will be great, and you will be the children of the Highest: for He is kind to the unthankful and to the evil. Forgive, and you will be forgiven. Give, and it shall be given unto you."

The disciples asked Jesus, "Who is the greatest in the Kingdom of Heaven?" Jesus called a little child and set him in the midst of them, and said, "Unless you are converted and become like little children you will not enter the Kingdom of Heaven. Whoever therefore will humble himself like this little child, he is greatest in the Kingdom of Heaven." "Whoever wants to be great among you must be your minister: and whichever of you wants to be chief must be servant of all."

Jesus sat near the temple treasure-chest watching people throw in their offerings. Many who were rich cast in much; but there came a poor widow and she threw in two mites, which make a farthing. Jesus called his disciples to Him and said: "This poor widow has cast in more than all; for they gave out of their abundance, but she, although herself in need, gave all that she had."

Here is a little group of the things



The Children's Corner in church.

Jesus taught his disciples on a mountainside : "Blessed are the poor in spirit, they that mourn, the meek, they that hunger, and thirst after the right, the merciful, the pure in heart, the peacemakers, and those who are persecuted for doing the right. You are the salt of the earth and the light of the world. I say that it is not just murder, but anger that brings a man into danger; not the sinful act, but the thoughts; not just swearing, but the need to add to your 'Yes' and 'No.' Resist not, but give even more than he asks to him who compels you. Love your enemies, as your Father which is in Heaven loves. Do not give alms, or pray to be seen by men. Lay up treasures in Heaven. Be not anxious; your heavenly Father knows your needs. Judge not, condemn not; and do not defile that which is holy. Ask and it shall be given you; seek and you will find. Enter in at the straight gate, for wide is the gate and broad is the way that leads to destruction. Beware of false prophets; test them by their fruits. He only shall enter into the Kingdom of Heaven who does the will of My Father. Therefore whoever hears and does these things is like a wise man who built his house on a rock."

Jesus said to His disciples : "If any man will come after Me, let him deny himself, and take up his cross and follow Me. For whoever will save his life shall lose it : and whoever will lose his life for My sake shall find it. For what is a man profited if he gain the whole world and lose his own soul ?"

"When the Son of Man shall come in His glory, and all the holy angels with Him, then shall He sit upon His glorious throne, and before Him shall

be gathered all nations. He shall separate them one from another as a shepherd divides the sheep from the goats, the sheep on His right hand, but the goats on His left hand. Then will the King say to them on His right hand : 'Come you whom my Father has blessed ! Inherit the kingdom prepared for you from the foundation of the world. For I was hungry, and you gave Me food; thirsty, and you gave Me drink; a stranger, and you took Me in. I was naked, and you clothed Me; sick, and you visited Me; in prison, and you came to me.' Then shall the righteous say : 'Lord, when ?' And the King shall answer : 'Inasmuch as you have done it unto one of the least of these My brothers, you have done it unto Me !' To those on the left He will say : 'Depart from Me ! I was hungry, thirsty, a stranger, naked, sick, in prison and you did not care about Me.' Then shall they also answer : 'Lord, when ?' And He will reply : 'Inasmuch as you did it not to one of the least of these you did it not unto Me.' "

Jesus said : "Let not your heart be troubled : you believe in God, believe also in Me. In My Father's house are many abiding-places. I go to prepare a place for you; and I will come again that I may receive you into Myself; that where I am there you may be also. And whither I go you know, and the way you know. I am the Way, the Truth and the Life."

Now you can see why the Christian religion is so important. It gives us the truth about God and ourselves and the world we live in. It shows us that life is a journey we have just begun, which continues after death. Read the stories and teaching of Jesus for yourself in the Bible. Begin with St. Mark which is the shortest Gospel, then read St John, St. Luke and St. Matthew. You may find it helpful to use a modern translation where the wording is in English as spoken today. Remember that Jesus is still alive in Heaven, and continuing His work and teaching in His Church. He said : "Lo, I am with you always, even to the end of the world," and for nearly two thousand years men and women, boys and girls have found it true. You will feel Him near and hear Him speak to you when you take time to be quiet and read your Bible and pray, and as you worship at school and in church. As you learn to love and obey Him, His Spirit will become yours, as He promised, and guide your life and your work. That is how "the will of God is done and His Kingdom comes on earth as it is in Heaven."

We are in this world to learn how to love and serve God Who made it.

"The true end of man is to glorify God and enjoy Him for ever."

THE FIRST PALM SUNDAY—JESUS RIDES INTO JERUSALEM

GAMES FOR YOUNGER CHILDREN PLAYED ALL OVER THE WORLD

Sports and Games

"ALL work and no play makes Jack a dull boy," runs the proverb. And that is true whatever your name is, and whether you are a boy or a girl. In this further section of the book you can read of sports and games you can play yourself, and others that you can watch and enjoy if you understand what the players are doing.

(1)

ASSOCIATION FOOTBALL

THE outer case of the football itself is made of panels of leather and this is inflated by a rubber bladder. The ball is made in sizes 1 to 5. Size 3 is suitable for boys 6-9 years old. Size 4 is best for the 10-15-year-olds. Boys over sixteen use size 5. A ball should be well cased if it is to maintain its shape and give good service. It should be kept well blown up and tightly laced. All dirt should be removed after play. Although it should not be put away wet it is bad to dry the leather in front of a fire. The ball should also be kept well greased with dubbin.

A professional player gives advice about football boots.

How to lace a football.

Each player requires a good pair of well-fitting football boots. Although the leather should be soft and pliable the toes must be quite hard. The laces which are supplied are longer than necessary to lace up the boots. Wind the spare lengths round ankle and instep as shown in the picture. This gives extra support to the foot. Keep

The right way to tie your boots.

your boots clean and replace at once any studs you may lose. Dubbin the boots occasionally to keep the leather soft and waterproof.

It is very important to play the game on a pitch which is the correct size for children of your age and you should not play matches for too long at a time. Here is a useful guide :

8-11 years, 20 minutes each way, on a pitch of size 70 yds. × 50 yds.

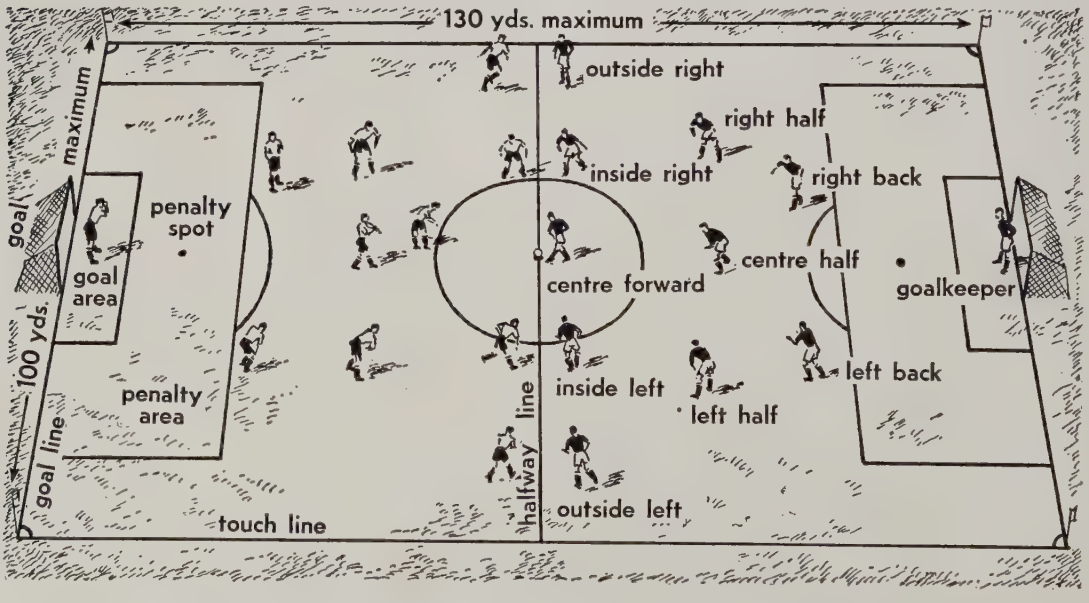
11-14 years, 30 minutes each way, 80 yds. × 60 yds.

14-16 years, 35 minutes each way, 90-100 yds. × 60-70 yds.

Adults play 45 minutes each way.

The game had its origin in England and is now played throughout the world. It is governed by the laws of the Football Association. You cannot hope to become a good player unless you know the important rules of the game.

Look at the diagram of the playing area and learn the correct names of the markings on the pitch. The playing space is bordered at each end by "goal lines" and on the sides by "touch lines." The pitch is divided into halves by the halfway line and at the centre there is a ten-yards circle. Note also that in a proper match four flags are used, one for each corner. Each goal is enclosed by a small rectangle to mark the goal area (6 yds. × 20 yds.)



A full-sized football field showing the players and their positions.

A dramatic goal scored during a schoolboy international match between England and Wales.

and a larger rectangle to mark the penalty area (18 yds. × 44 yds.). The penalty spot is 12 yards from the centre of each goal.

The game is played by 11 players on each side. Note their names and where they stand at the kick-off. Notice especially where the centre and inside forwards stand when their side has the kick-off. After a goal has been scored against them they have to restart the play at the centre. The opposing inside forwards and centre forward must, of course, keep outside the centre circle until the ball is played.

The game is controlled by a referee with the help of two linesmen. Each player is duty bound to play to the rules and it is the referee's job at all times to see that he does so. The referee is entitled to penalize any player's team for breaking the rules.

The captains spin a coin for choice of ends or the kick-off. Unless the winning captain chooses to kick-off, the side which loses the toss kicks off at the centre and then each side tries

Two professional players engaged in a tussle for the ball during a practice game.

This young player is being taught the correct way to throw the ball in.

to propel the ball into its opponent's goal. The ball, which must be kept within the bounds of the playing area, may be propelled or checked by any part of the body except the hands and arms. The goalkeepers are exceptions to this rule but only when they are inside their own penalty area. Players must not use their hands or arms to push or hold an opponent. Tripping or jumping at an opponent, and charging unfairly are all considered fouls and are penalized by the referee awarding a free kick against the offending team. This kick is taken from the place where the foul was committed, and whilst it is being taken opposing players must stand at least ten yards from the ball.

When the ball is propelled out of the field of play it is put back into play by a player on the opposing side. If it crosses a side line or touch line, as it is called, a "throw-in" is taken. The player taking the throw-in must stand with part of each foot behind or on the touch line. He must use both hands and throw the ball from behind his head. He is not allowed to play the ball a second time until it has been touched by another player.

If the ball goes out of play by crossing a goal line and it is last touched by an attacker, the goalkeeper or any other player restarts the game with a goal-kick into play beyond the penalty area. He kicks the ball into play from within the half of the goal area nearest to where it went out of play. All opposing players must stand outside the penalty area. The player is not allowed to play the ball a second time until it has been touched by another player.

If the ball crosses the goal line and was last touched by a defending player, it is put back into play by a

corner kick. This is a free kick taken by an attacking player from the corner of the field. Note that the ball must be kicked from inside the quarter circle called the quadrant. He must not play the ball a second time until it has been touched by another player.

A penalty kick is awarded against a defending player who intentionally fouls an attacking player or who handles the ball inside the defence's penalty area. The kick is taken from the penalty spot with only the goalkeeper defending. All the players other than the goalkeeper and the player taking the kick must be outside the penalty area and at least ten yards away from the penalty spot. The kicker must not play the ball a second time until it has been touched by another player. The goalkeeper stands on his goal line until the ball is kicked.

A player is not allowed to stand close

Taking a throw-in.

Taking a corner kick.

to his opponent's goal and just wait for the chance to score. The chances are he would be "offside" as soon as he interfered with the play. The rule that stops this is called the offside law and by it a player is punished by a free kick being awarded against his team. This law states that a player is offside if he is nearer his opponent's goal line than the ball at the moment the ball is played unless (*a*) he is in his own half of the field of play ; (*b*) there are two opponents nearer to their own goal line than he is ; (*c*) the ball was last touched by an opponent or was last played by him; (*d*) he received the ball direct from a goal kick, a corner kick, a throw-in, or when it was dropped by the referee. It is important to note that a player who is in an offside position cannot be penalized unless he interferes with the play or with an opponent.

Your worth as a player depends largely on your skill with a football. To become skilful requires much practice on the right lines.

When kicking a still ball do not run

Some volleys require a high kick!

more than about five steps. Keep your eye on the ball. Keep your toe down and use your instep. Practise often with each foot. When kicking a moving ball practise by asking a friend to roll the ball towards you. It requires careful judgment to kick it in the desired direction. Use each foot with the ball coming from different angles and at different speeds.

Kicking on the volley is the name given to kicking a ball before it bounces. To do this lean well back and use your arms to keep your balance. Watch the ball carefully on to your instep. Learn to use each foot. Kicking on the half volley is when you kick the ball as it touches the ground or immediately after it has bounced. Use your instep.

It is very important to learn how to give and take passes on the run. Each pass given should be accurately placed and each pass taken should be collected without stopping or even slowing down. Use the whole of the inside of either left or right foot and push the ball along the ground.

Dribbling means moving along with the ball at your feet, especially when you try to prevent an opponent from getting the ball from you. You can do this most successfully if you keep well over the ball and as you move think of stroking it with your foot to propel it forward. It should only move a foot or two away from you. You can use either the insides or outsides of your feet.

Ask a friend to throw the ball up into the air towards you so that you can practise bringing it down to your feet. This is called controlling or trapping the ball. There are many ways in which you can do this. First try to "catch" the ball on the instep of either

A player practises heading.

A forward about to beat his man.

A swerve to his right—and he's away!

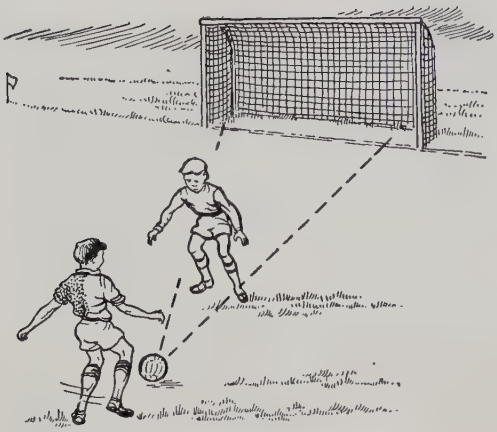
foot. Another way is to press down the sole of the foot on to the ball just as it reaches the ground. You can use the inside edge of your foot or the outside edge in the same way. Other ways of bringing the ball down are with one knee (raise your knee and let it "give" as the ball drops on to it), your chest (you let your chest sink as the ball falls on to it) and your head (by withdrawing your head as the ball hits it). In all cases pounce on the ball as soon as it reaches the ground and get over it so that it becomes yours.

Throwing in is the standard method of putting the ball into play after it has crossed a side line. You should hold the ball with well spread fingers. The rules governing the throw-in state that you must have a part of each foot either on or behind the touch line. You must take the ball well back behind your head, otherwise it will be a foul throw. A long throw is made by leaning well back.

In heading the ball always use the forehead and move towards the ball with your body and with your head. In this way not only can you become skilful but you will be able to head fast oncoming balls without the slightest chance of hurting your head. A useful way to improve your ability is to practise keeping the ball up either by yourself or with the help of a friend.

If you are a goalkeeper you should practise a great deal at catching balls coming towards you from different angles and heights. The picture shows how to collect the ball at waist height. The player has moved quickly across the goal to collect the ball in front of

Collecting a ball at waist height.



Narrowing the field of vision.

his body. If the ball goes through his arms it will be stopped by his body.

A goalkeeper must get down low to collect a low shot at goal. He must move quickly to get to the ball and he should ensure that if he misses it with his hands it will be stopped by his legs from entering the goal. On the rare occasions when a goalkeeper cannot catch the ball he should tip it over the crossbar or push it around an upright, and thus give a corner to the opponents. On occasions when a single opposing forward is advancing towards your goal with the ball, it is best to move out towards him. By so doing you will reduce your opponent's field of vision of the goal, and will give yourself a better chance of getting within reach of the ball when it is shot at your goal.

(2)

ATHLETICS

ATHLETICS is the sport of running, throwing and jumping. Athletic meetings are held out of doors on a sports' field properly marked out.

RUNNING

Boys and girls love to run, but not all can run well. Here are some useful hints on how to improve your running.

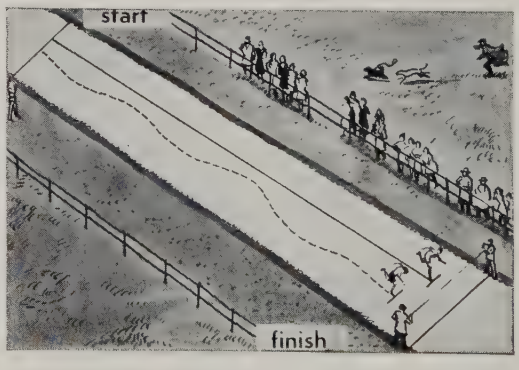
Run straight. This is not as easy as it sounds but it stands to reason that if you run in a direct line from start to finish you will cover the shortest distance !

It is foolish to look round to see where the others are running. It not only makes you run slower but you take the risk of having a nasty fall.

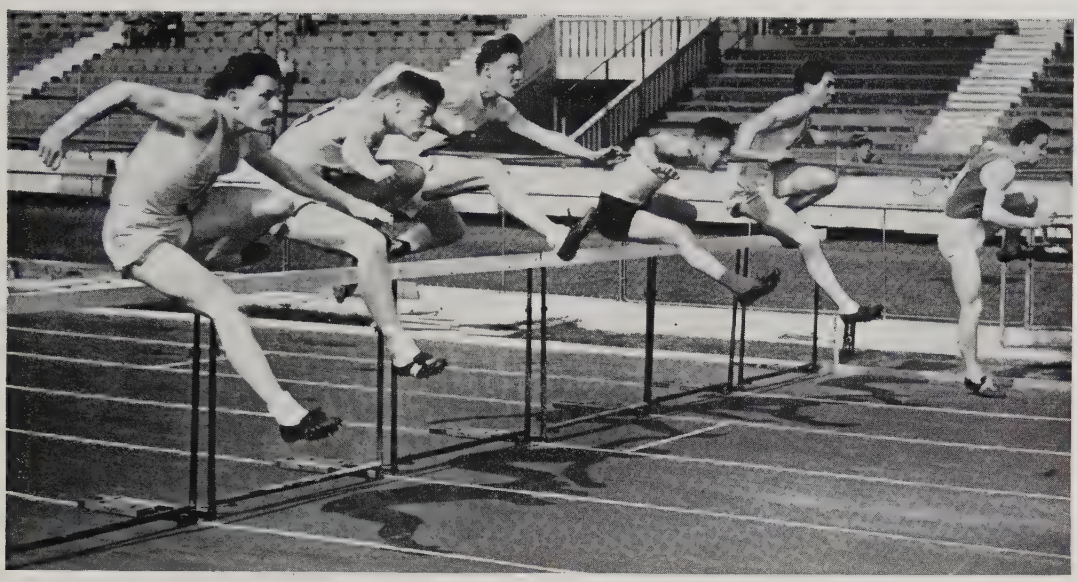
Run through the finishing tape. The so-called "tape" is usually white wool and you are expected to run through it.

Lift your knees up in front. When some children try to run fast they kick their legs up behind them. This is wrong.

Swing your arms backwards and forwards. The arms should be kept



Both these runners have covered the same distance but the straight runner is winning.



Schoolboys hurdling in a championship match.

bent at the elbows and swing straight forwards and backwards from the shoulder. Stress the backward swing.

Run on your toes. Keep well up on your toes and see that your feet point forward.

Stop running gradually. It is wrong to pull up suddenly after you have crossed the finishing line. Run on for several yards.

It is generally a good plan, after slowing down to return to the finishing post in case the judges wish to take your name.

If you are under ten you should use the standing start. When the starter says "on your marks," or "get ready," you should take up a position at the starting line with most of your body weight over the front foot, which should be toeing the starting line.

On the word "go!" you should push hard with both feet and get your legs moving as quickly as you can.

Children of ten years and upwards should use the crouch start. When this is done correctly it is better than the standing start. If you cannot do it well you are advised to use the standing start. On the words "On your marks," step forward to the line and toe it with one foot. Quickly put the

Striding along with ease.

other foot behind it (toe to heel) and then take the front foot away and kneel down on one knee alongside the other foot. See that the arms are shoulder width apart, elbows straight, fingers spread behind the line. Make sure

The position at "Set."

the toes of the back foot are well tucked under. It is a position of ease. On the command "set," transfer most of your weight over the front foot. The knee should only be three or four inches off the ground. You should now be ready to spring into action. On "go" (or when the pistol is fired) push hard off both feet and get your legs moving up and down as fast as you can. Your arms swing forward vigorously and you gradually increase your steps until you reach your full stride about 10–15 yards away.

HIGH JUMPING

Most boys and girls start with a running jump from the front. As they grow older they learn other ways. Whichever way you use, it is very important that you think about what you are doing. How far should you run? It is useless to run a long way and arrive at the rope tired. There is an easy guide. Stand with your back to the rope and walk away from it for ten steps. Turn round and that is your starting point.

Which foot should you jump off? Try first one foot and then the other several times and you will find that you like to jump off one better than off the other. Most children like to jump off their left foot. A rough guide is that if you are right-handed then usually you are a left-footed jumper. If you are left-handed you are a right-footed jumper. This is so in most cases.

How far from the rope should you take off? This, of course, depends on

The position at "Go!"

the height you are jumping but a good guide is 2–3 of your own foot-lengths from the rope. The distance of your take-off from the rope is very important. If you start to jump too far away

Clearing the bar with ease

you will knock the rope on your way down. If you take off too close you will hit it on your way up. See that you take off the right distance away.

A "scissors" jump should be done with a run up of 10 steps and you should run from the *opposite* side from the foot you jump off. Try jumping from one side and then the other. Most children prefer one to the other. You will most likely find that if you are a right-handed person you prefer to jump the "scissors" from the right. You take off 2-3 foot-lengths from the rope. The angle at which you run up to jump is very important. It should be about 45 degrees. Remember to run up at a medium rate with springy steps. Use your arms vigorously as you jump.

Under expert coaching and with suitable equipment older children may be taught the "straddle," the "western roll" and other more advanced styles.

STANDING LONG JUMP

Here is another way to test how good you are at jumping, but you need the help of a friend. Stand with your feet slightly apart and toeing the line. Your arms should be raised over your head. Now bend at the knees and hips as you swing your arms backward. Without stopping swing them forward and upward vigorously as you leap forward along the ground. Notice that you must first stretch your body then lift your knees high and then land reaching well forward with your arms. Your friend who should be standing alongside then marks the spot where your heels land. The distance from the

Take-off, mid-flight, and landing in the long jump.

starting line to this point is now measured as you jump. Measure the distance with your *own* feet. Seven foot-lengths is good. Eight is very good and nine is excellent. Now let your friend try but make sure he measures with his feet. Perhaps Father would like to have a go ! But make him measure with *his* feet !

The hop, step and jump.

STANDING HOP, STEP AND JUMP

This is an event which older children do with a run—but to do this you need a jumping pit of soft sand. The standing jump is done like this. Take up a standing start position with your body weight over the back leg. Now swing your weight forward and spring off the front foot (left), land on the same foot (this is the "hop"), spring forward on to the other foot (this is the "step") and then spring off this front foot (right) and land on both feet. This is the "jump." The distance from the starting line to the heel marks is measured. Again use your feet to measure the distance. Twenty-one foot-lengths is good, 24 is very good and 27 is excellent. Each time you spring, say to yourself "Hop ! Step ! Jump !" Try it several times starting with your left foot forward and then with your right. Which do you prefer ?

RUNNING LONG JUMP

This is an event for boys and girls over ten, but it is only possible where a soft sand pit is provided. You can practise it at the seaside on firm dry sand. All you have to do is to dig over a portion of the sand to form the pit. All jumps are measured from the edge of the take-off board to the first mark made by the jumper in the sand (usually his heels). Make a good fast run-up from a point 25 walking steps away from the take-off board. It is most important that you take off with your jumping foot as near as possible

A junior champion in the long jump.

Pupils watch closely as an expert demonstrates the long jump.

to the edge of the board. You should practise the run and take-off over and over again until you get it right. When you take off swing your arms vigorously and lift your knees high.

A "no jump" is when you take off beyond the edge of the board. In competition a "no jump" is counted as one of your three jumps.

THROWING THE CRICKET BALL

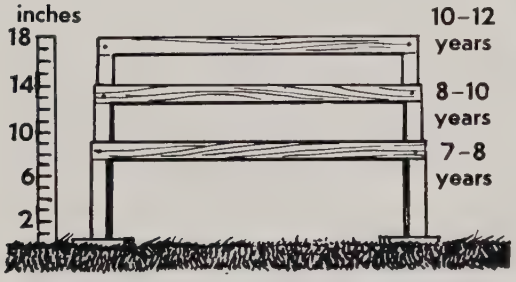
For this event you require a run-up of about 20 walking steps. Stand with your feet together and with the ball gripped firmly in your fingers. As you run up to throw gradually increase your speed so that by the time you reach the throwing line you are running quite fast. When you are about three steps from the line turn sideways by taking one leg behind (or in front of) the other and change step (as in bowling). As you do so extend your throwing arm well backwards. Throw with the whole of your body and don't forget to run over the line after you have thrown. This is allowed but you MUST let go of the ball before you cross the line. The distance from the line to the spot where the ball lands first is measured.

Grip for throwing the cricket ball.

HURDLING

This is the name given to the race in which those taking part each have a set of small fences (called hurdles) to jump over as they run. It is an event for older children but even seven-to-eight-year-olds can have great fun practising it.

Do not have your hurdles too high. You ought to be able to step over them as you run. Here is a guide :



These hurdle heights form a useful guide for the ages indicated.

Practising hurdling indoors.

7– 8 years	9 inches
8–10 ,,	14 inches
10–12 ,,	18 inches

Always step over with the same foot leading and take *three* steps in between.

(3)

CAMPING AND HIKING

CAMPING is largely common sense and any youngster can enjoy it if he or she goes about it in the right way from the start. So let's discuss camping first and see what it all means.

Before we think about camp kit and camp sites, let's imagine that you are one of a party that is thinking of going camping. If you are between nine and twelve the best way to go camping is to go in small groups or patrols of six to eight at a time, and you must have an older person in charge of you, otherwise it is very worrying for your parents. So get an adult leader if you are just starting to camp.

Secondly, be quite certain for a start that you are not going to camp very far away from home. It is not necessary to go too far to find a good camp site.

Now let's think about camp kit, because you cannot travel very far afield without some kind of equipment, and right away I would advise you to buy the very best that you can afford. There is an awful lot of rubbish on the market at cheap prices but if you are prepared to pay a little more and buy a really good brand of equipment

it will last you many years and give you endless pleasure.

The most important thing you will need is not a tent, at least for a beginning, but a rucksack. You can hire a tent to start with or borrow one.

The best kind of rucksack to look out for is a steel frame one which must be fitted to your particular shape and build. Don't buy a rucksack by post, but go to a reputable camping and sports' goods shop and try it for yourself under expert adult supervision. There is nothing more silly or dangerous than to see a youngster with a loaded rucksack which is clearly the wrong size for him and unsuitable in so many ways. The steel frame should sit lightly on your back, and your shoulders, and it should feel firm and easy when it is on.

The beauty of a frame rucksack is that it allows a stream of air to pass between your back and the load you are carrying and this means that perspiration can escape instead of "seating" on your back and causing colds and chills.

The rucksack must be made of lightweight yet waterproof chrome leather and canvas, with the sack fitted with a good strong drawcord and zip-fastener map pocket if possible.

Keep your rucksack empty when not in use and hang it up, sack open and downwards, on a large hook in a dry and airy room. Keep it brushed well inside and out, and never dry it in front of a fire if it gets wet. Also buy or make a name tag for it, and have it sewn on firmly.

At the bottom of your kit can go your two lightweight blankets or better still your down sleeping bag, your spare change of clothing and your personal belongings in the way of cooking and eating utensils, all wrapped neatly in linen bags which you can

The steel frame rucksack should sit comfortably on your back and shoulders.

Some of the equipment you should take with you on a camping expedition.

make at home. They can be in waterproof cloth if you like, since sooner or later you are bound to have to strike camp in rain and then you will have to pack wet stuff as well as dry. Carry a pair of plimsolls or light sandals for the evenings and mornings, a simple repair kit for clothes, and a personal torch as well as your own towel, soap, and tooth brush (toothpaste you can share with a friend if you like). A spare battery and torch bulb is more than useful should you get stuck out in the dark one night with a torch that has given out.

Carry a spare light pillow case made up at home in which you can put your spare clothing at night to make a pillow. The most important thing to carry is a pullover or sweater, for even summer evenings can sometimes get very cold and you will need it, while you can slip it on over your pyjamas on a cold night for extra warmth. Keep your map in an outside pocket, also your compass and clasp knife and a notebook and pencil.

At least one of your party ought to carry a tin of reliable unscented foot talc powder and a good but simple first-aid kit. Whether you go camping or hiking or both you need to carry out a simple daily foot drill, preferably in the evenings, so that you clean the feet carefully in warm water once a day and then, making certain the nails are trim and square at all times, talc the feet both at night and again in the morning.

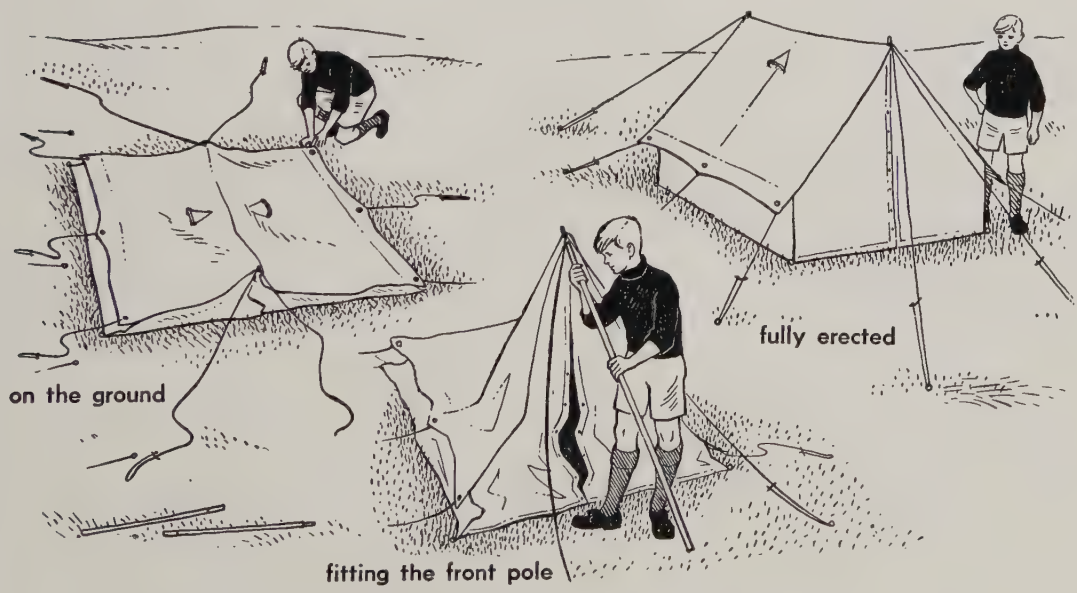
Right at the top of your rucksack place your groundsheet neatly folded. It is always the first thing you need

when you come to set up camp. There are some excellent ones on the market and you can either buy a rubber one with a canvas backing and solid eyelets for pegging it down if you wish, or a lightweight and more expensive one in oiled cotton with tough bound edges. Some of the new plastic ones are both lightweight and excellent to use in all sorts of weather but whatever kind of groundsheet you buy and use take great care of it, making certain that you change your shoes in camp, for the easiest way to damage a groundsheet is to tear it with nailed boots or shoes, or to puncture it with a fork. Also make certain that you never spill oil or paraffin on it. *Never* sleep without a groundsheet.

You will probably invest in a simple pressure stove which uses paraffin for fuel, and solid methylated spirits for starting and priming.

Always make certain that you never fill the tank more than two-thirds full and that you carry it in a canvas or waterproof bag of some kind with a draw-cord. Keep it well away from food, which can be kept in outside pockets of the rucksack when you are on the move, in linen or plastic food bags; while in your aluminium Gilwell or cooking canteen you can carry your fresh meat (or fish on occasion), your eggs and bacon and sausages, while butter can be kept in a plastic container or bottle with a screw top.

Tents are expensive and you may have to share the purchase of one with friends. What you need is quality with a fair price so do not buy a flysheet as you will be camping near home in the first two or three seasons of your camping life. A flysheet is a marvellous addition to a tent. It keeps the tent cool in high summer and warm on chilly days, but it does



Three stages in pitching a two-pole lightweight tent.

double the cost of your home under canvas, doubles the weight to be carried and is not necessary for green field camping.

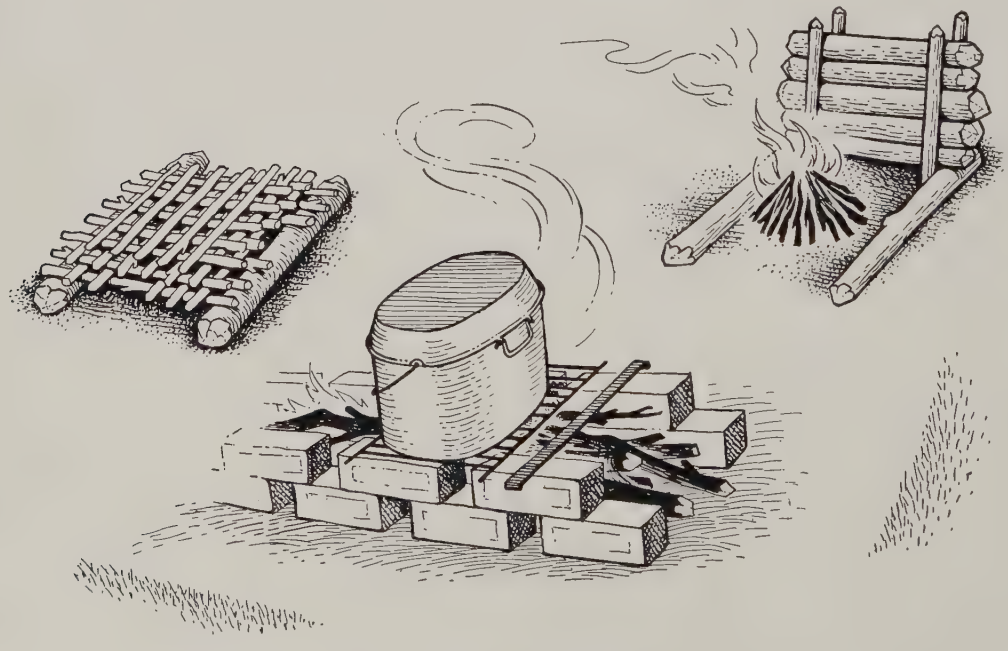
All these items also apply to girls except that girl hikers and campers may prefer to use the new smart "ski-sacks" in a variety of popular colours instead of a rucksack for short journeys.

In selecting a camp site remember that if you join a camping club you will be provided with a first-class list of approved camp sites throughout the country. Such a list provides you with all the information you are ever likely to need. If you have to find a site on your own, or prefer to do so, then look for a well-sheltered site, sheltered that is from the prevailing wind (ask the local people about this) and also sheltered as regards privacy. The lee of a haystack often provides a good site near a farm in bad weather, providing you take all possible fire precautions and the farmer agrees.

Try to get near a safe water supply, and do not have too far to carry farm produce, wood or provisions. On the other hand it is worth having to put up with a bit of inconvenience in this respect so long as you have the privacy. The site should be well-drained so do look for gently rising ground, with some protection in the way of trees or hedges or a stone wall. Never camp under trees, for dripping rain from trees in full leaf will stain a white tent badly on occasion, and at night roosting birds will make it even worse.

Take lots of local advice as to drainage so that you don't pitch your tent in a pleasant dry spot which turns out to be wet and boggy if summer storms come.

Make sure you know the addresses



Three different types of camp fire for cooking or warmth outdoors.

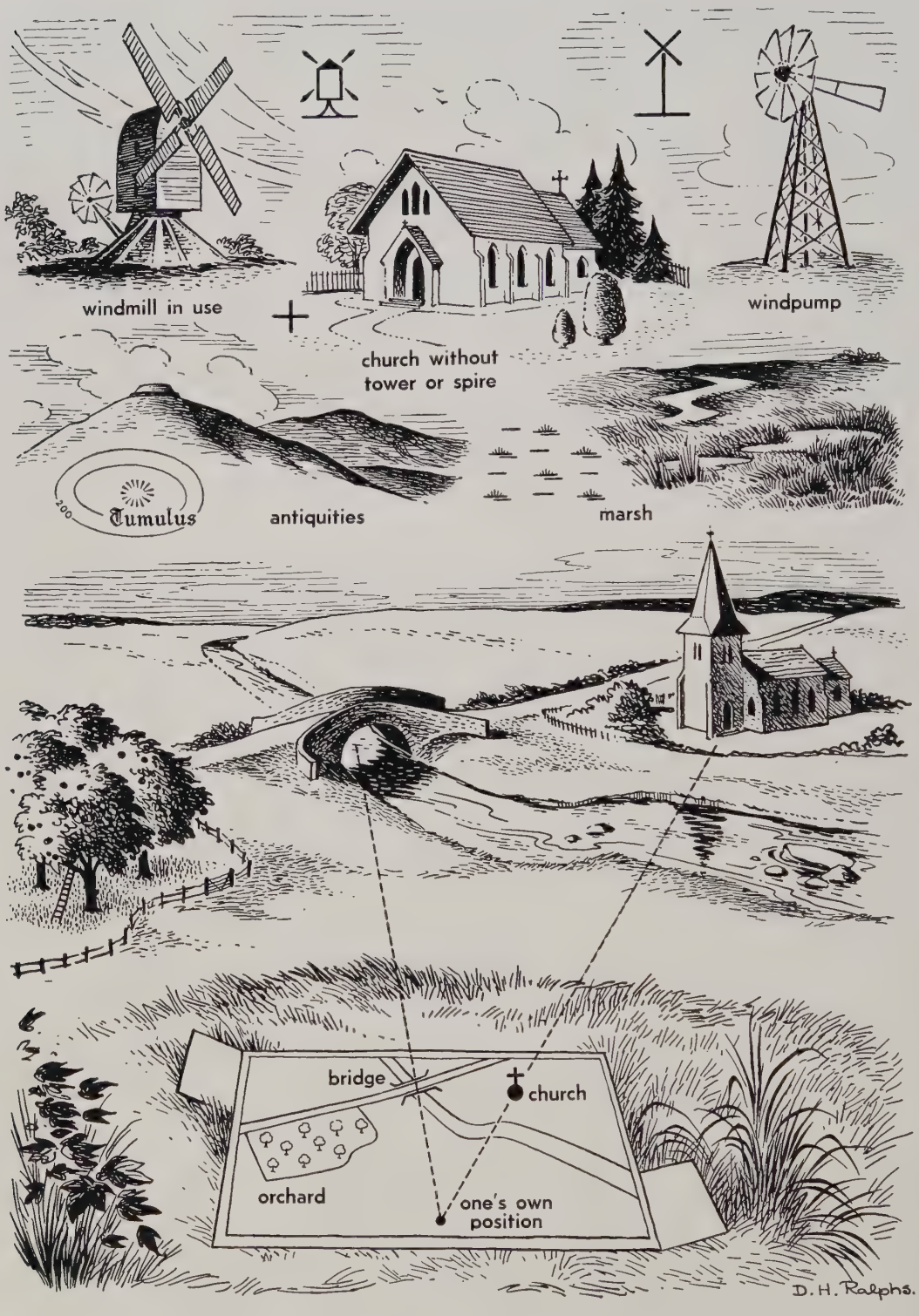
Hikers enjoying the scenery while walking up a hill.

and 'phone numbers of the local police, doctor and hospital just in case they may be necessary. For cooking-fires be careful not to use green or growing timber and make your fires in a sheltered spot away from the tents on a stone fireplace if you can. If not, build a fire in a place which the farmer recommends to you and do what he tells you. If you use a paraffin pressure stove, carry a paraffin filter and always use it before filling the tank. In addition, carry a supply of prickers and a small brush for cleaning the stove in dusty weather. Make your cooking spot in a sheltered place with a canvas shield round the stove, or an improvised one of biscuit tin lids will do.

Try and do something constructive during your camp, such as bird and animal watching, searching for old stiles, old churches or old buildings of historic interest, or building a bridge for the farmer over a dry gully: anything like that will make your camping seem so much more worth while. As a precaution against farm animals fence or rope your tent off if necessary and keep your fresh meat in a home-made larder—an enamel plate covered in muslin, and slung from a tree branch will do.

If you prefer hiking to camping or want a change now and then from tents, then join the Youth Hostels Association. There are hundreds of youth hostels and you can have a fine

Don't leave those gates open!



(*Top*) Some conventional signs commonly used in map-making. You will find more of these signs on page 131 of Book 2. (*Bottom*) How to discover your own position on a map.

time planning walking tours in some of our most beautiful scenery and using the hostels at leisure. In this way the equipment you will need to take with you can be cut to a minimum. A sleeping-bag is necessary, and so, of course are toilet articles such as a tooth-brush, soap, etc. These, together

Don't leave a site like this!

with a cup, plate, knife, fork and spoon, and a change of clothing, are just about all you will need, as nearly all hostels provide beds and mattresses, hot meals morning and night, and packed lunches to take with you if you wish.

Don't forget that you can combine a tent and hostel holiday if you wish, so that if there are not enough hostels on the particular route you plan, then tents can be carried and used.

The most important thing in hiking is to keep yourself fresh and spruce. A shower each day if the hostel has one, or a brisk rub-down all over with a rough towel will work wonders. Maintain the daily feet routine and change stockings frequently, wearing two pairs on the move so that the outer pair rolled down over shoes or boots will keep out stones and gravel.

A pair of binoculars is most useful when hiking, and so are mittens if the weather is cold, as it may well be at Easter or any time during the spring. Another useful asset is a waterproof map case with a plastic window.

Lastly, observe the Countryside Code at all times when out in the open air hiking and camping and enjoying yourself. Never leave gates open or walk across growing crops even if it *does* look like grass. Don't feed farm animals and don't let them get into fields where they should not be. Never drop litter, and what you cannot burn on the spot should be taken in your rucksack to the nearest litter basket or refuse bin, or home, if necessary.

Stick to the path round the edge of a field of growing crops.

An exciting moment in the annual Eton versus Harrow match at Lord's Cricket Ground. The batsman has cut a fast ball through the slips.

(4)

CRICKET

THE blade of a good cricket bat is made from the wood of the willow tree. The handle is made of spliced cane, wrapped with cord and covered with rubber.

A bat needs special care if it is to do its job properly. Its blade should be oiled several times with a light oil before being used for the first time, and should also be oiled occasionally during use. Do not oil the splice. Make sure that the bat is the correct size for you. Children aged 6–8 years require size 3; 8–10 years size 4; 11–14 years size 5. The size is usually stamped on the end of the handle.

Children aged 6–8 years should play with a tennis ball. Later they should progress to a solid rubber ball and then to a leather or composition ball. Leather balls are only suitable for use on grass. Use the youth's size of $4\frac{3}{4}$ ounces.

Here are the dimensions of an adult pitch. Length 22 yards; wickets 28 inches high, and when set out for play 9 inches wide. The bowling crease is 8 feet 8 inches in length with a return crease at each end. The batting

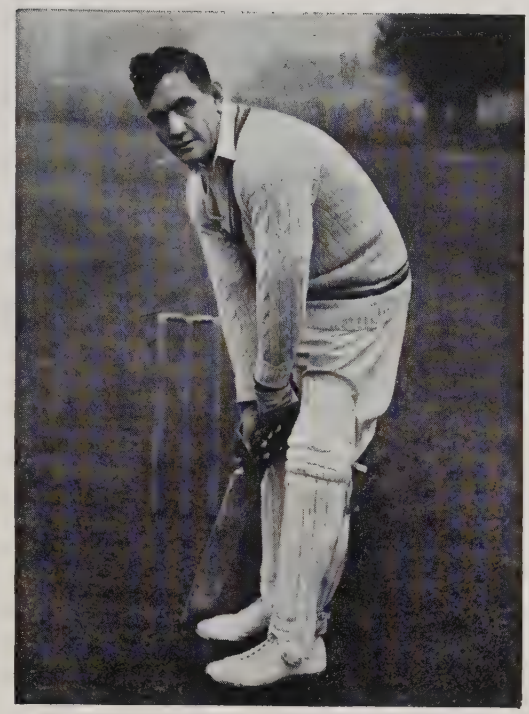
The batsman's grip.

or "popping" crease is marked 4 feet in front of the wicket.

Boys should use shorter pitches as follows: under 8 years, 18 yards; under 10 years, 19 yards; 10-12 years, 20 yards; 12-14 years, 21 yards; 14 and over, 22 yards. Boys playing in their own gardens, parks or on the seashore are advised to pace out 22 of their own normal walking steps. The wickets should be twice the width of the bat blade and the batting crease should be the length of the whole bat plus the length of the handle from the stumps.

When gripping the bat you should keep your hands close together and your right hand should be half-way down the handle.

Notice that the batsman standing on guard has taken up a sideways position in relation to the bowler. He has turned his head and he is looking along his left shoulder. He has one foot on each side of the batting crease and is standing with his weight on both feet. It is a position of readiness, for he must be able to move quickly either forward or backward as the need may arise.

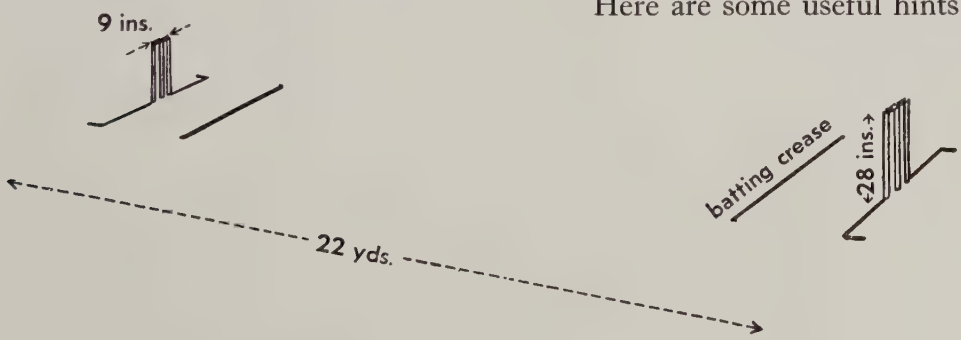


Batsman on guard.

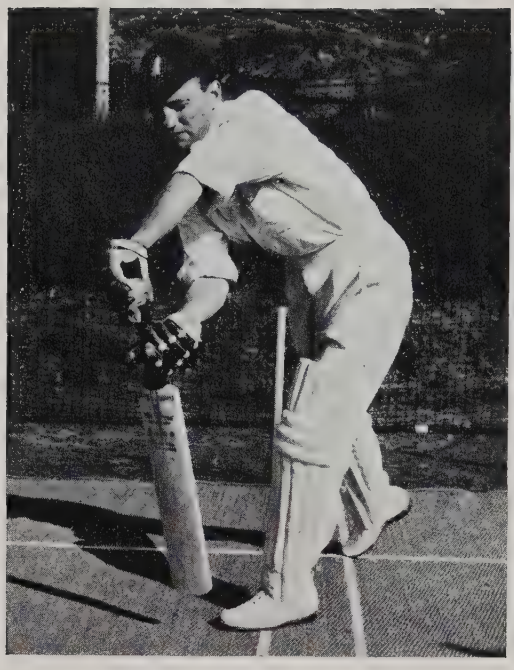
A full-sized bat has a blade $4\frac{1}{2}$ inches wide, which means that when it is held upright it will protect nearly half the wicket. Try always to play your strokes with the bat in this upright position.

An upright bat swung along the ball's line of flight is called a "straight bat." A cross bat does not guard your wicket nearly so well.

Here are some useful hints on how



A cricket pitch showing measurements, batting creases and wickets.



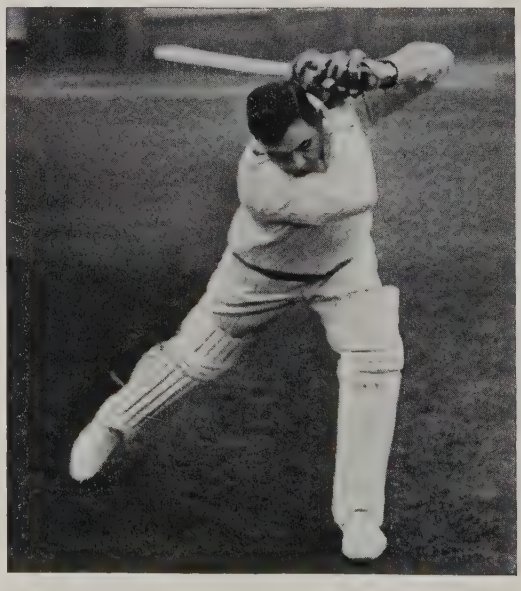
Playing forward defensively.

to carry out the forward defensive stroke.

When you are in the "on guard" position keep your eye on the bowler as he runs up to bowl. As he bowls lift your bat high above your head and in line with your shoulders. The next move is to step out with your left foot to the pitch of the ball and bring down the face of the bat in the path of the ball. Watch the ball all the way on to the bat. Your body weight should be well forward, left elbow high, and head down. This is the most important stroke of all for defending your wicket. Practise it frequently and, when possible, with a friend to check your positions.

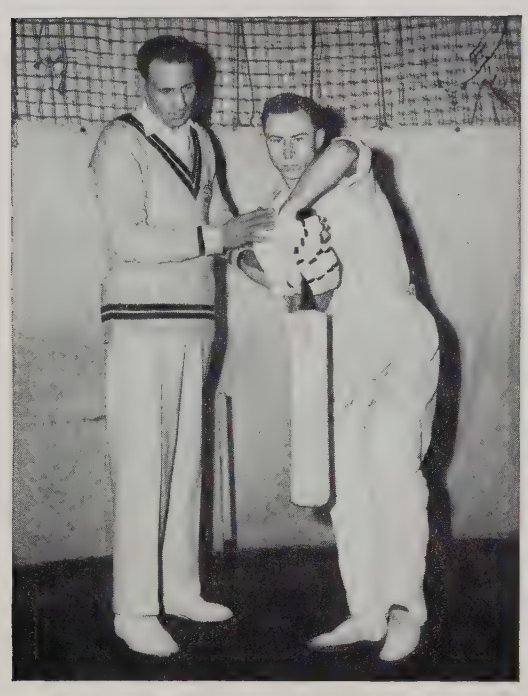
Another important forward stroke is the forward attack. A batsman uses this stroke when the ball bounces near enough for him to hit it hard. The ready position and the lifting of the bat high overhead are the same as in the defensive stroke. You should then step out quickly with your left foot to the bounce of the ball and push your body weight well forward on to your front foot. In the completed stroke all your body weight is now on the first foot and your bat has been swung through and across your left shoulder.

A batsman can also defend his wicket by playing backward. This stroke should be used instead of the forward defensive stroke when the ball is pitched rather on the short side. Take up the "on guard" position once again watching the bowler approaching the wicket. Lift the bat back high and start moving your body backwards. After you have stepped back close to your wicket, you should have moved all your body weight over your right foot. Your bat comes down full face,



The forward attacking stroke.

You will soon be able to recognize the fielding positions from this drawing of a cricket match being played on the village green.



The backward defensive stroke, with the weight on the right foot.

along the flight of the ball. Keep the bat upright and your left elbow high. Your head should be above and immediately behind the bat handle.

A good batsman, when not actually batting, stands on the opposite side of the wicket to the side used by the bowler. He keeps wide of the pitch and moves forward as the ball leaves the bowler's hand. If he has to run, he grounds his bat about 3 yards away from the opposite crease. The striker always calls except when the ball goes behind his own wicket. He should call distinctly "Yes!" or "No!" or "Wait!"

Running between wickets—the batsman at the bowler's end beginning to move.

The picture opposite shows the best way of holding the ball in the fingers, when you are beginning to bowl. As you grow older, and more experienced, you will wish to alter your grip according to the type of ball you wish to bowl, e.g. leg break, off break and so on.

An easy way to learn to bowl correctly is as follows :

Stand with the ball held firmly in your bowling hand, about 20 paces away from a wall. Your weight should be on your right leg and you should be looking forward over your left shoulder

Running between wickets—getting home.

or between the space formed by your head and raised left arm. Now lean over to your right and without pause rock your body sideways to the left and release the ball directly over your head. As you do so try to brush your hair with your arm. Do this many times until you can hit the wall with one bounce only, six times out of six

balls. Now draw a line on the wall 2 feet 6 inches from the ground and see if you can do the same, hitting the wall below the line with the ball bouncing only once each time.

You should now learn to approach the bowling crease with a cross-over step and bowl. Measure back $1\frac{1}{2}$

The beginner's bowling grip.

walking steps from the line of the wicket and stand, ball in hand, with your left foot forward. Now make a cross-over step with the right foot at the same time raising your arms above your head. Take the left leg sideways and forward over the bowling crease and swing the right arm forward and

The fast bowler in action.

A young cricketer is learning under expert coaching how to deliver the ball.

downward and backward and upward in a circular movement, and release the ball from the hand high over your head.

Measure a spot five paces away from the bowling crease. Stand with the ball in your hand, keeping your feet together. Step off with your left foot and walk the correct number of approach steps, saying to yourself as you go: left foot, right foot, left foot, step over with the right, take the left foot to the side, and bowl! Now do it with an easy run. Later when you have had more practice you may prefer a longer run. Try a seven- or even nine-pace run-up. Remember to start off your run with the same foot each time.

Fielding can be great fun if you understand what you are doing and

The wicket-keeper's stance.

you have taken the trouble to practise. One of the best ways of becoming skilful is to throw a tennis ball at a wall and catch it or field it to the best of your ability each time it rebounds. Always throw the ball hard. Whenever you can, use both hands for stopping the ball, but also learn to catch high and low balls with either hand.

Here are some important points to remember when catching a ball. Move your feet quickly so that you are in a position to receive the catch. Watch the ball until it is safely in your hands. Spread your fingers widely and form a cup with the hands. Withdraw a little as the ball enters the hands. This is known as "giving with the ball" and it prevents the ball from rebounding out of your hands. It also helps to take some of the "sting" out of the ball. Practise as often as possible with a friend. Throw the ball high and low, short and long, fast and slow. Use a hard ball (leather or rubber) whenever you can as this will prepare you for the real thing.

When throwing in on the field, try always to throw the ball low, as this of course, reduces the distance and time of the throw.

(5)

CYCLING

THERE is a good deal more to cycling than sitting on the saddle and pushing the pedals round. Whether you want to go adventuring down country lanes or merely to ride to and from school you will have more fun if you are an expert cyclist.

An expert cyclist looks after his machine, rides correctly and observes all the Rules of the Road mentioned in the *Highway Code*. He always gives the recognized hand-signals when turning, avoids wobbling, stops at every "Halt" sign and never passes a traffic light signal unless it is showing green. He would not think of riding on a public road on a bicycle that was not in perfect order. A loose nut or a weak chain can cause a wobble, and this might cause a nasty accident.

The *Highway Code* says that you *must* have efficient brakes. You can-

The girls with bicycles will travel farther than their friends who are hiking, but the hikers will be able to leave the roads, whereas the cyclists must keep to them.

not be sure that your brakes are efficient if you do not test them each time you go for a ride. To do this grip the brake levers as tightly as possible. If the connecting rods are loose or the cable weak they will give under the strain, and you can do something about it before it is too late. Next, try each brake separately to make sure that it really stops the wheel with only a slight pressure on the lever. More than one inexpert cyclist has landed in a bed of nettles or hit a brick wall through failing to test the brakes properly before setting out.

The riding position is very important. If you cannot touch the ground with both feet without leaving the saddle, then the latter is too high. It is safer to have the saddle too far back than too high. With the correct position the bicycle will be under perfect control. You will not be liable to wobble on uneven road surfaces or when riding slowly.

You can test a bicycle for size before buying it; but you may have to experiment with the saddle and handlebar before you find the most suitable positions. Generally, the front of the saddle should be about two inches behind the centre of the bottom bracket, that is, the centre of the axle to which are attached the chainwheel and cranks.

Try this with a piece of string and a weight. Hold the free end of the string against the front tip of the saddle, allowing the weight to hang a few inches from the ground. If the saddle is correct the string will be

about two inches behind the centre of the axle.

Keep your back fairly straight, but not stiff like a poker. Now, lean forward slowly until you have to hold the handlebar to support yourself. The arms should be almost straight, and you may have to raise or lower the handlebar to get the grips in the most comfortable position. When you have cycled regularly for two or three weeks you will be able to feel whether the saddle is correct. For instance, if you find that you can only thrust downward on the pedals instead of turning them, you are probably sitting too far forward.

No one supposes, for one moment, that you will try to ride with the brakes on permanently; but there are several less obvious things that make cycling difficult. Soft tyres will waste a great deal of your energy. Pump up the tyres so hard that you cannot make any impression by squeezing them with one hand. Not only will this make cycling much more easy, but the tyres will last longer and will be less liable to be punctured.

Some of the important road signs you should immediately recognize.

Your bicycle should be the right size for you. The size of this bicycle is of suitable proportion to the size of its rider.

If your machine is fitted with a three-speed gear, use the middle gear for normal riding. The bottom is intended for hills and when riding against a strong headwind, while the top gear can be used with advantage when there is a strong following wind. If you watch other cyclists you will soon notice that the expert riders use a fairly low gear, and turn the pedals smoothly and steadily. Less experienced riders, often with soft tyres, seldom change down from top gear. Instead, they swing their bodies backward and forward, stamp on the pedals, and wobble about on the slightest slope. What hard work they make of their cycling !

Have you ever placed a spot of oil on your fingers and rubbed them together? They slip without any resistance, don't they? Oil is used in the bearings and other moving parts because it reduces the resistance caused by friction. A correctly oiled bicycle will require much less effort to drive it along than one with mud on the chain and rust in the bearings.

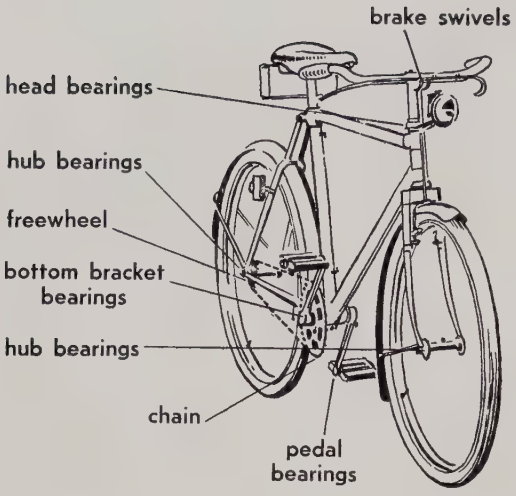
Oil your bicycle about once a week. It is best that you have a regular maintenance day. Do your cleaning, adjusting and oiling on the same day each week, and the task will not be forgotten. Clean off the dust and grit first, making sure that no mud drops on to the chain. Several good polishes for enamel can be obtained from most cycle dealers; but ordinary cycle oil can be used if you have nothing else. Clean all plated parts with oil; but thoroughly dry the wheel rims, and do not allow any oil to run on to the brake blocks, tyres or saddle, where it will only do harm.

You will have no difficulty in finding where to lubricate the hubs, pedals, bottom bracket and steering head. The freewheel may have a hole for the oil; but, if not, lay the machine on one side and inject a little oil between the outer, toothed ring, and the side plate. The chain can be cleaned with an old tooth-brush. Then, turn the pedals backwards and trail an oilcan along the lower run of the chain.

When you know all the lanes and roads near home you will want to go farther afield. Cycling grows on you like that. A touring bag will be needed, and it is wise to choose a fairly large one. When you go for a cycling holiday you will appreciate the extra space.

An expert cyclist always takes certain things with him on every ride. A repair outfit, tyre levers, spanners that fit all the nuts and cones, and a cape are the first essentials. If he is

The equipment which the expert cyclist takes on a lengthy tour.



Parts which need regular oiling.

going to explore the countryside he takes a map, too.

Before starting out, check your equipment, making sure that it is complete, and test your lights. Spare bulbs can be bedded in cotton-wool in a matchbox. Keep your food in a tin or a polythene bag, and always have a reserve supply of chocolate or raisins. Most kinds of drinks can be carried in a feeding-bottle conveniently fitted to the handlebar. It is advisable to pack a sweater in your bag in case the weather turns unexpectedly cold.

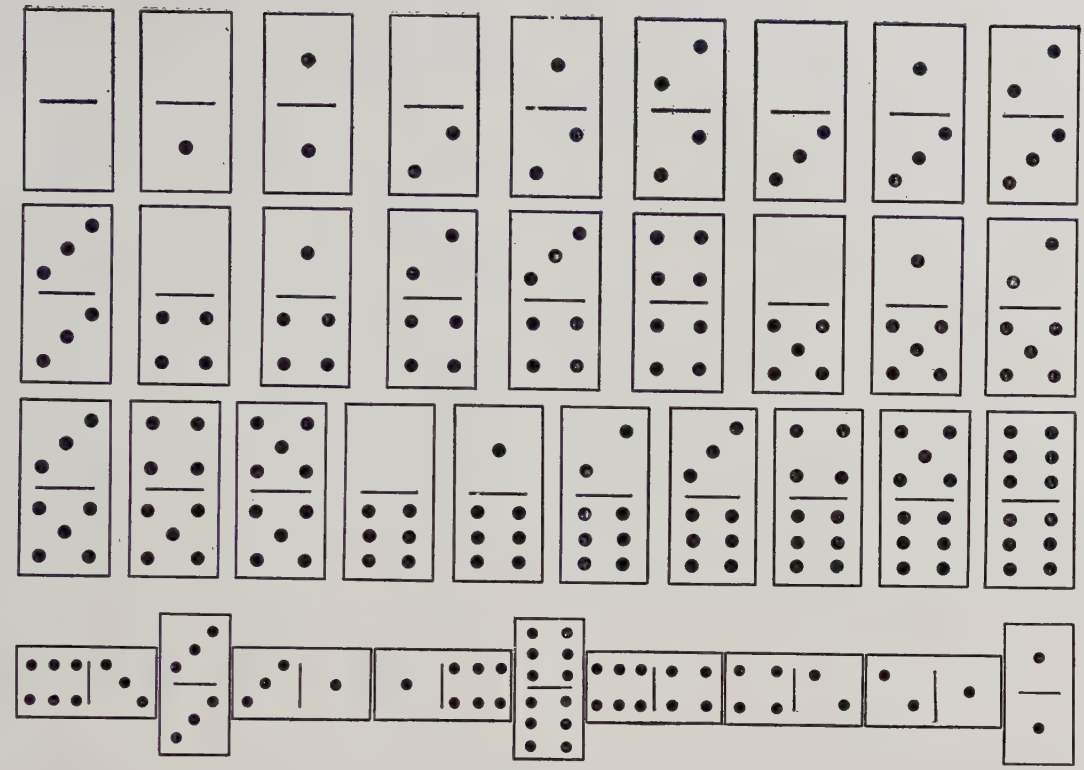
Avoid main roads as much as possible. If you study your map you will usually find an alternative route via minor roads and lanes. These are quieter and much more enjoyable. Sometimes you cannot escape busy roads, and you must use your cycling experience. Change into bottom gear at traffic lights or road junctions, and never try to squeeze in on the left of vehicles unless it is obvious they intend to turn right. When you want to turn right, look behind first. If the road is clear, hold out your hand and steer towards the centre of the road. Stop in the centre if there is oncoming traffic.

Remembering these simple rules, and with your bicycle in perfect order, you can begin to enjoy all the benefits and pleasures that cycling offers: exercise, adventure, discovery and fun!

(6)

DOMINOES

THE ordinary set of dominoes has 28 pieces as shown. Note that there are seven doubles, ranging from double blank to double six. There are many different ways of playing the game but in each case the dominoes must first be turned over on their faces and shuffled. Two, three, or four people may play. Each player chooses a domino and the lowest gains the advantage of playing first, the next lowest plays next, and so on. Each then takes seven dominoes. If less than four are playing the extra dominoes are put to one side. Each player then either stands his dominoes upright on their long edges or holds them in the palms of his hand so that only he can see them. The first player places his most suitable domino face upwards on the table. The next player places one of his down end to end so that the



A full set of twenty-eight dominoes, from double blank to double six, together with (lower line) a typical game in progress.

joining numbers are the same, 5–5, 3–3, and so on. So the game proceeds.

When there are four people playing and a player is unable to go he merely misses his turn and the next player able to go plays. With fewer than four players there will be a reserve of unused dominoes lying face downwards in the middle of the table. The first player who cannot go must draw a domino at a time from this reserve, until he can go, or until the reserve is exhausted. The first player to play all his dominoes is the winner. If no one can play then all players turn over their dominoes and total the "pips." The player with the lowest score is the winner.

A simple variation of the same game is called "Blind Dominoes." The players place their pieces face downwards in line and try to play the left-hand piece each time it is their turn. If they cannot play then, the piece is put down on the right of the row and the next player takes his turn. If, when all the dominoes are tried no one can play, then the player with the smallest number of "pips" or dominoes in his hand wins.

To succeed at dominoes try to keep *both* ends open to yourself as long as possible. You should also try to play so that the numbers at both ends correspond with the numbers you have most of. This means that the opposing players will then be more likely to be blocked and unable to go.

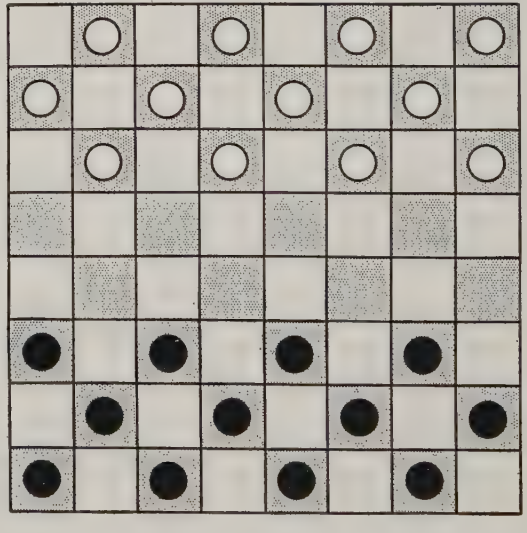
A game of draughts played on the pavement at Stonehaven on the east coast of Scotland.

(7)

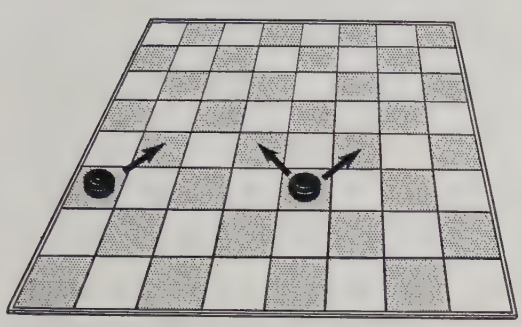
DRAUGHTS

FIRST set the board correctly. A black square should be on your extreme left. Now arrange the twelve pieces on the black squares of the first three rows. As the game is played entirely on the black squares your opponent must do the same even though his pieces are white.

The object of the game is to capture (remove from the board) all your opponent's pieces or to prevent him from being able to move any one of them. All the pieces are of equal value and can only move diagonally forward one square at a time. If any enemy piece is immediately in front of one of your pieces and there is a space behind along the same diagonal, then you capture the enemy piece by jumping over the top into the vacant

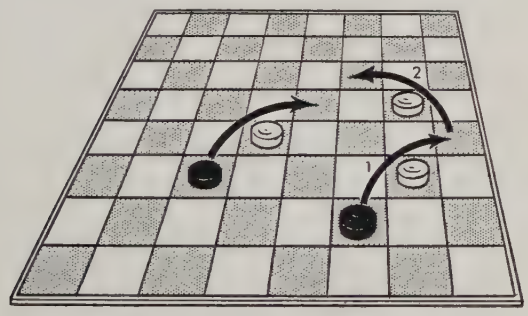


The board at the start of a game.



Moving forward one square at a time.

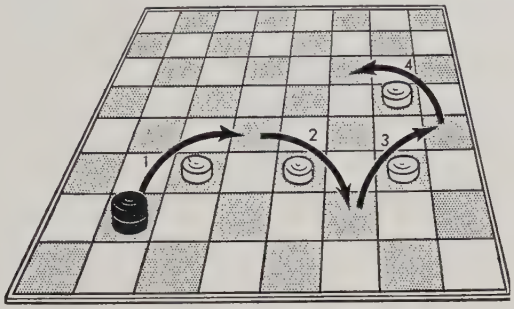
square. You can do this once, twice or more in the same move and so remove two or more enemy pieces at one go! If you do not make a capture although it is possible, your opponent can make you take back your move and take his piece; he can ignore the fact that you have not taken off his piece, or he can "huff" your piece off the board (remove it altogether) before making his next move. If you succeed in getting



Capturing in one, or two jumps.

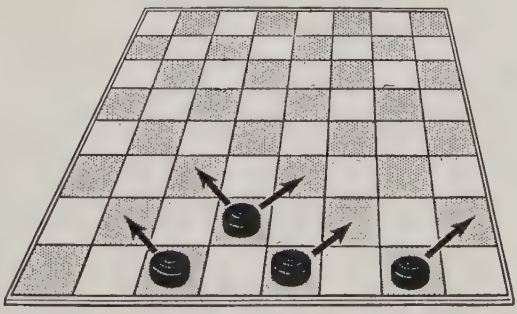
a piece to the far side of the board then your opponent must crown your piece by placing a spare piece on top. This double piece or "king" as it is called, can now move backwards as well as forwards and can take in any diagonal direction.

Before you begin to play, notice the corners of the board. Corners at bottom left and top right have single black squares. The other two corners have double black squares. Note then that one black can hold one white in the single square corner but cannot do so on the double corner. Note also that black can hold white against an edge but cannot do so if the edge is part of the double corner.



A king taking four pieces.

When playing a game try to keep the four pieces shown (especially the three pieces on the back row) in position as long as possible. In this way you can easily prevent enemy pieces from reaching your line and becoming kings. Note : two kings can always beat one enemy king even though the enemy king backs into a double corner. In a similar way three kings should always beat two enemy kings.



Keep these four pieces in position as long as possible.

A peaceful fishing spot in Herefordshire.

(8)

FISHING

WHEREVER you go on holiday, you are likely to be within reach of water with fish in. Fishing makes a perfect accompaniment to camping, for example. You can even add something interesting to the menu! So it is well to go prepared.

Rod-and-line angling falls naturally into two distinct sections: salt-water and fresh. Sea fishing will be the thing for you if you camp near an estuary or the open sea. It is all free fishing, and practically everything you catch makes good eating.

Freshwater angling divides again into trout fishing and fishing for the so-called "coarse" fish: roach, perch, rudd, chub, gudgeon, dace, carp, tench, bream. If you ask politely, you can usually get permission to fish for these latter fish. Some of them—perch particularly—make very good eating, especially if the cook knows his job. The rest are not so good to eat, but they give a lot of sport, and roach with bacon makes a good breakfast. You will be unlikely to get permission to fish for trout in England, but landowners and farmers in Scotland and Wales may raise no objection. Trout and salmon are far more numerous in those countries.

First, sea fishing. If you are going to fish from a boat or pier, or from the high wall of a jetty or harbour, you can manage without a rod. You need only a length of flax line wound round a wooden winder, a hook tied to a length of nylon, and a lead weight to sink your bait to the bottom.

You simply attach your bait to the hook, throw it out, let it sink to the bottom, and gather up the line until it is tight. When you feel a tug on the line you "strike" and heave in the fish. This is the simplest and most primitive form of fishing—and very effective, too.

But it is far more fun if you have a rod and reel. The same rod will serve for light sea fishing and for float fishing in fresh water. It should be something between seven and eleven feet long. Steel "aerial" rods may still be available, and are quite effective. But the best kind of rod, which will cost rather more, is a three-joint affair, about 9 ft. 6 in. or 10 ft. long, with two lower joints of cane and the top joint of lancewood. At a pinch, you can manage to catch fish with a garden cane or a sapling, but such makeshift rods will not allow you to use a reel, and using a reel is great fun and extends the range of possibilities.

A reel is merely a machine for storing line. Then, if a fish makes a strong run, you can let him "take line"—and later, when he tires, you can rapidly wind the line back on to the reel. Reels come in all shapes and sizes, but a simple, robust "Nottingham" type is very cheap, and a very good one with optional check and lineguard does not cost a great deal. And it's a very nice thing to have.

The most useful line is modern nylon—strong, cheap, and almost invisible in water. You can buy 25 yards of four-pound breaking-strain nylon for very little. Fifty yards of it is better still.

Now all you need are hooks, leads, and perhaps a float. Most sea fish feed on the bottom, and then you don't need a float, but mullet and mackerel feed near the surface, and then you do. To find out what sort of fish are caught locally you need only ask.

If you are fishing for mackerel or mullet in a harbour, fix your float about two feet from the hook. For mullet, bait up with a bit of bread or bacon. For mackerel, bait with a

grayling

trout

salmon

These game fish are caught mostly in clear, fast-running waters by the method known as fly-fishing.

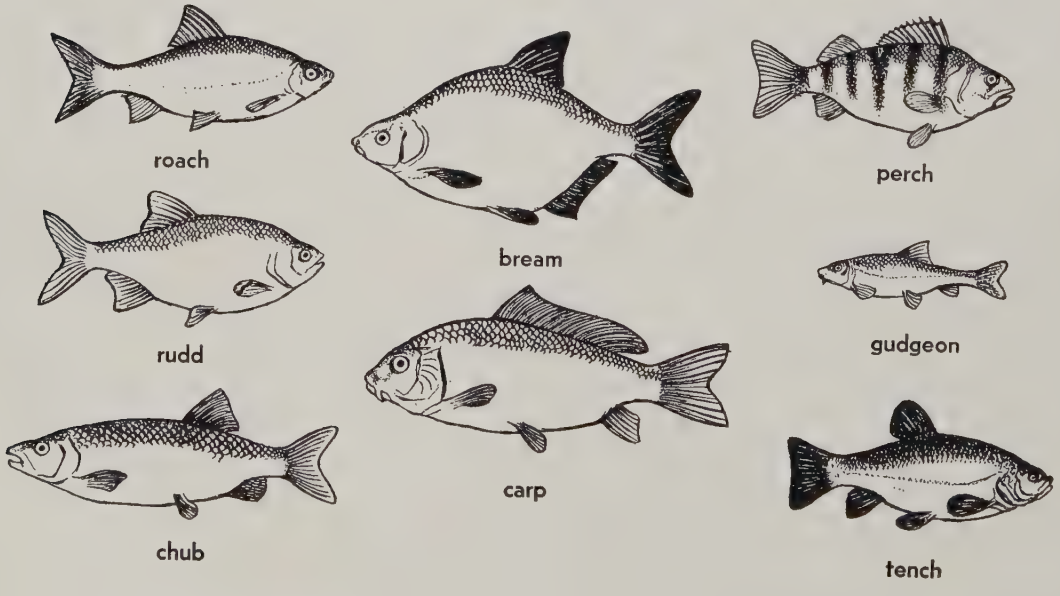
scrap of fish, ragworms or lugworms. Lugworms can be dug up on most sandy shores—you can see the holes in which they hide. Attractive baits for all sea fish are slipper limpet, shrimps, prawns. Mussels sometimes answer the purpose, and a very good standby is a sliver cut from the side of a mackerel or herring.

Casting out into the surf from a beach you may catch bass—wonderful fighting fish, wonderful to eat—or flatfish such as plaice, soles, flounders. In such fishing you use no float, but a heavy lead to keep your bait on the bottom in the pounding surf. You start reeling in as soon as you have cast out, for fish like a moving bait.

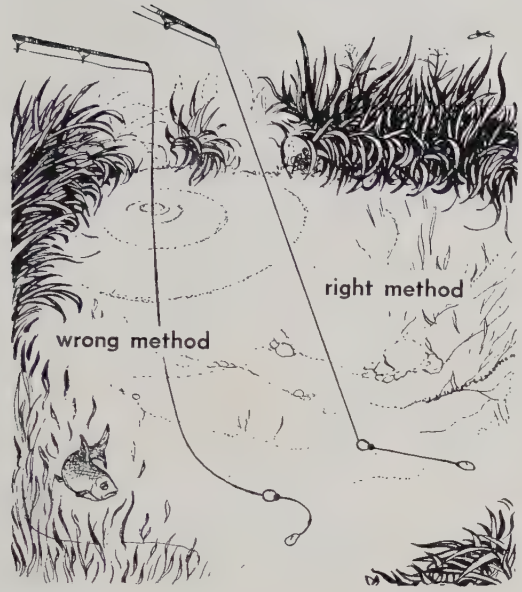
Freshwater fishing divides into still-water and running-water angling. In either case, adjust your float so that the bait is right on the bottom—most fish feed on the bottom. In still water you merely sit and wait for a bite. When fishing in a stream, your float drifts with the current and you have to retrieve it—quietly, without splashing—and start again every few minutes.

In one method of fishing, known as ledgering, the bait is held on the bed of the river or lake by a pierced lead weight through which the line runs freely when the bait is taken by a fish. When fishing in this manner always keep the line taut. A slight jerky movement of the rod-tip indicates when a fish is biting.

Good hook baits for freshwater fish are red worms, maggots, wasp grubs, bread paste, and crust. Suitable bread paste is made by wrapping a hunk of stale bread in clean cloth, soaking it, squeezing the water out, and kneading it in your hands until fairly firm. A scrap of this is moulded round the hook in an irregular shape, to cover the point.



These are all known as coarse fish, and some of them making good eating.



Keep the line taut when ledgering.

When the float dips under, strike by raising the rod tip *smartly* but not *violently*. Let the fish run if he wants to; don't try to rush him. Keep the rod tip held high with a good bend in the rod. *Draw* a fish ashore, if you haven't a landing net—don't try to lift him clean out. And if you're going to keep the fish, kill it at once by a smart blow behind the eyes—don't let it flap about.

Finally—fish aren't fools. You will only catch them if you keep *still*, keep *quiet*, and keep *out of sight*. Talking doesn't matter, but tramping up and down the bank is fatal to fishing. Good luck—and tight lines !

(9)

GYMNASTICS

HERE are some interesting tricks that both boys and girls from the age of 8 upwards can learn with a little practice. When you can do these there are many more you can learn such as one-handed cartwheels, backward roll to hand stand, hand spring and head spring. They are all great fun!

KNEE AND ELBOW BALANCE

Take up the crouch position. Make sure your arms are inside your knees and that the palms of your hands are flat on the floor. Your knees should be above your elbow. Now press your knees apart with your elbows and at the same time press your knees together. Keep your head up and gradually lean forward until your feet come off the floor. Hold the balance.

FORWARD ROLL

Stand facing a mat or on soft grass. Take up the position knees bend, arms forward. Now reach forward with your hands and spring off your feet, tucking your head under as you go.

HEAD STAND

Bend down and make an equal sided triangle between your forehead and hands, which should point forward. Now gently push up until your legs are straight, feet together and heels over the neck. Keep your body straight.

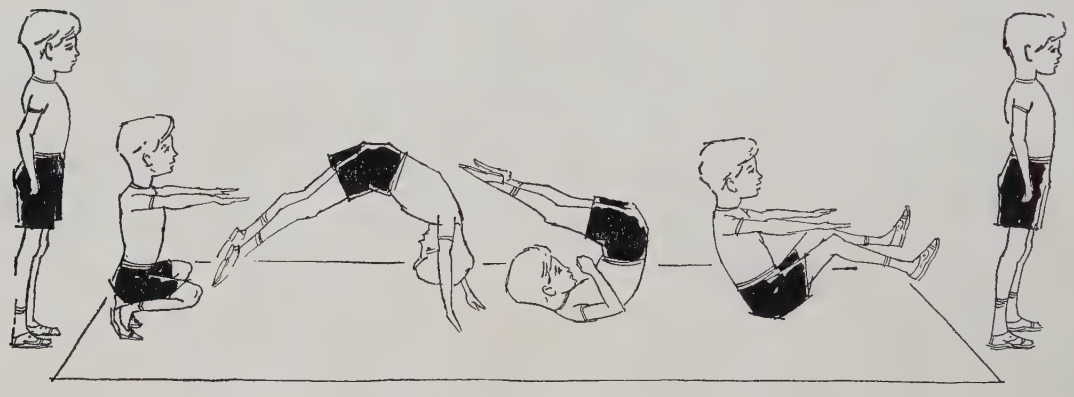
BACKWARD ROLL

Stand with your back towards the mat. Sit back as you reach forward, pressing your chin on to your chest.

As you roll back keep your knees up on to your chest, place your hands flat under your shoulders on to the mat. When you are well over, push firmly with your hands to get up to the standing position.

Your partner prevents you from going too far over and directs your feet above your neck.

To hold a balance, slightly arch your hands. Kick up gently. If you feel yourself going backward press on your finger-tips. If you are coming down forwards press on the heels of your hands.



The forward roll, from the "knees bend, arms forward" position.

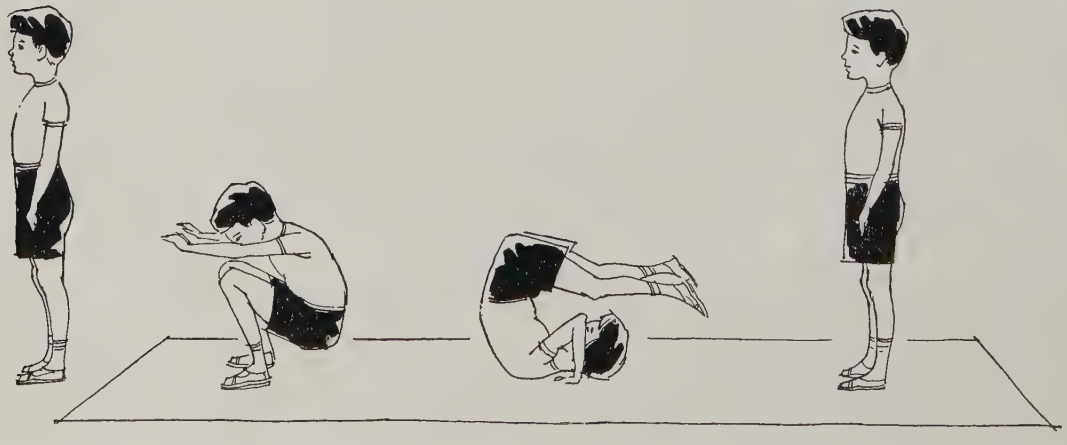
HAND STAND

Take up a position as on page 257. Arms should be shoulder-width apart, elbows straight, hands point forward, fingers open; shoulders over your hands and head up.

As you kick gently, straighten your legs. Do not move your hands. Keep looking forward. Stretch your ankles.

CRAB POSITION

Lie on the floor with your hands flat under your shoulders. Your feet should be well apart and well up to your seat. Now push very hard until



The backward roll, showing how you push yourself up with your hands.

SPORTS DAY MAKES RUNNING AND JUMPING MORE EXCITING THAN EVER

GAMES AND PASTIMES FROM MANY COUNTRIES ARE SHOWN HERE.

SOME OF THEM HAVE NOW BEEN TAKEN UP ALL OVER THE WORLD

CAMPING IN THE RIGHT WAY GIVES THE MOST ENJOYMENT

you make a high arch in the air. Later you will be able to walk like this.

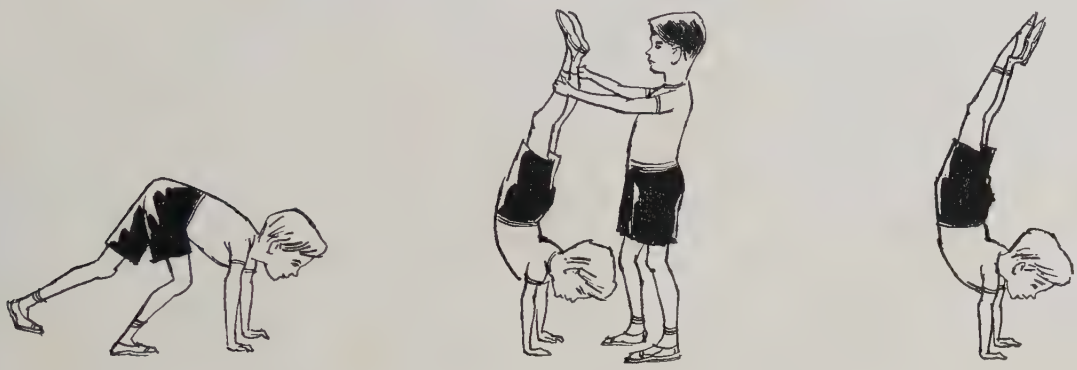
CARTWHEEL

Take up a bent sitting position. Turn over sideways so that you take up an all fours position facing the other way. Now turn completely over so that you regain the same position as when you started. Do this at least twenty times. Now try a cartwheel from a "knees bend" position. Practise and practise again until you can do a standing cartwheel from an astride position with arms sideways. Most boys and girls find the cartwheel easier to the left.

HAND WALKING

Kick up to a hand stand a little more vigorously than usual and when you feel your legs going backwards a little further than they do for a hand stand take a short step forward with first one hand then the other. Now try again and again remembering to topple backwards before moving your hands and to keep your legs straight and together.

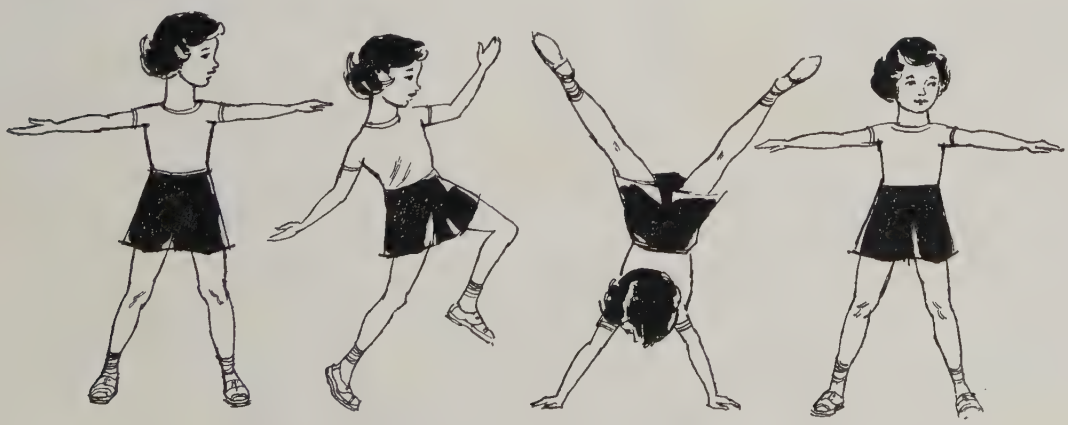
Keep your steps short and keep your head well up.



For the hand stand you will need a friend to hold you steady.

HAND STAND—CRAB

Carefully kick up to a hand stand, keeping your head well back. Lower

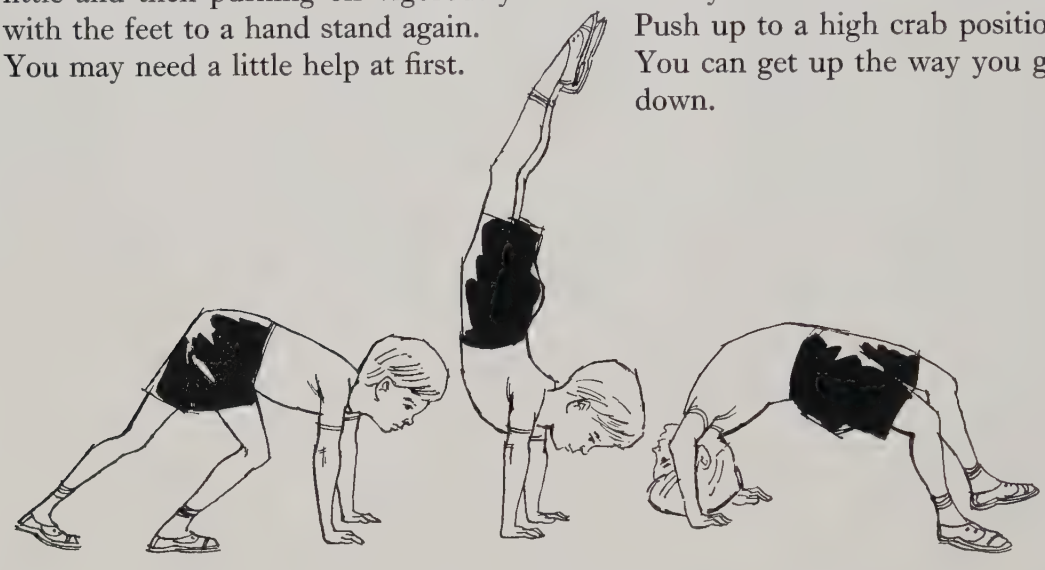


This is a standing cartwheel to the left.

your legs over your head until your feet reach the ground and so take up the crab position. It is possible to get back again by bending the knees a little and then pushing off vigorously with the feet to a hand stand again. You may need a little help at first.

BACK BEND—CRAB

Stand with your feet astride and arms over your head. Now arch backwards as you bend your knees forward until your hands touch the floor. Push up to a high crab position. You can get up the way you got down.



The hand stand—crab is a follow-through from the ordinary hand stand.

(10)

HOCKEY

This game is very popular with girls, although it is also played by boys. Hockey with boys and girls in the same teams is not recommended.

The game is played between two opposing teams of 11 players and the object is to score goals by hitting the ball with a hooked stick between the opponents' goal posts. Only the flat side of the stick may be used.

It is very important to choose a stick which is the correct size and weight for you. Here is a guide to help you but remember that you should go chiefly by what you feel is best for you. Children 8–10 years—16 oz.; 10–14 years—17 oz.; 14 and over—18 oz.

Remember to keep the hockey stick clean and if the hooked end is made of brown mulberry wood to wipe it occasionally with an oily rag (using linseed oil). If the hooked end is made of light ash wood, rub a piece of candle over it to give it a protective wax covering.

Balls may be made of leather, plastic, or cork, but leather ones are best. They should be kept clean and white. For children 8–14 years old the ball

should weigh $4\frac{3}{4}$ oz., for 14 year-olds and over, $5\frac{1}{2}$ oz.

Boys usually wear lightweight football boots. Girls should wear the specially made rubber soled canvas boots, which are studded.

The goalkeeper needs special equipment. She wears special pads, and kickers, which are padded covers which she straps over her boots.

Overleaf is a diagram of a hockey pitch. A full-sized pitch should be 100 yards long by 60 yards wide. Girls and boys up to 10 years of age should use a pitch 80 yards by 40 yards; 10–14 years 90 yards by 50 yards.

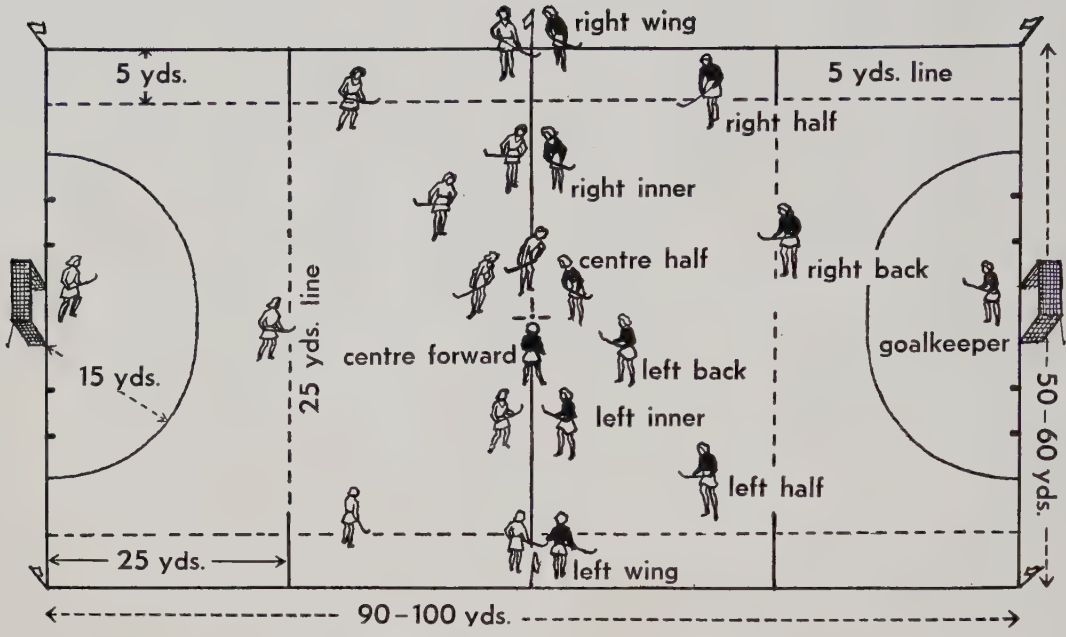
The game is played by two opposing teams each with 11 players. Each team consists of one goalkeeper, two backs, three half backs, and five forwards. The names of the positions given to these players are slightly different in the boys' game. The names used in the girls' game are shown in the diagram. For boys, alter left wing to outside left, right wing to outside right, left inner to inside left, right inner to inside right. The rules of play for boys and girls are practically the same, the chief differences being those concerning corners. The game is controlled by two umpires, each of whom is responsible for one side line and one half of the pitch.

Children 8–10 years old should play 20 minutes each way; 10–14 years 25–30 minutes each way; over 14 years 35 minutes each way.

A bully-off in the centre of the field starts the game and restarts it after half-time (when the teams change ends) and after each goal. The rule about the bully states clearly, "To bully the ball each player shall stand squarely facing the side lines and shall tap first the ground behind the ball and then her opponent's stick over the ball three times alternately, after which one of these two players must strike the ball before it is in general play."

When the ball crosses a side line it must be rolled back into play by a player of the team opposing the player who last touched the ball. When taking a roll-in, your feet, stick (and, in the boys' game, the hand) must be behind

An international women's hockey match between England and Wales.



A hockey field, showing names and positions for the girls' game.

the side line and you must roll the ball so that it touches the ground within 1 yard of the side line.

In the girls' game, when a corner and penalty corner are given six of the defending team must keep behind the goal line until the ball is hit, and all attacking players must be outside the circle. The forwards of the defending team should be beyond their own 25-yard line. No member of the attacking team may be in the circle until their own player taking the corner hits the ball. No one may stand within 5 yards of the player taking the hit.

The bully-off.

In the boys' game the penalty corner is taken in the same way as in the girls', but when a corner is awarded the difference is that all the defending team must go behind the goal line until the ball is hit.

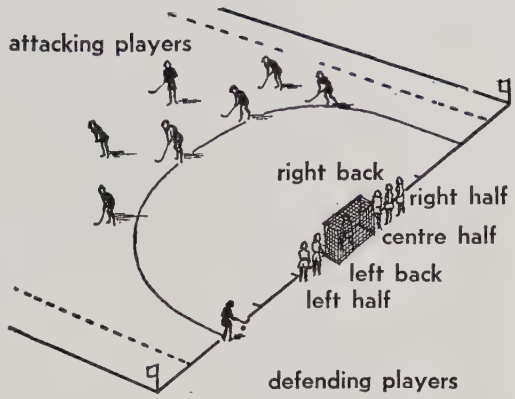
A player is offside if there are less than three opponents between her and their goal line. The rule is to stop players from waiting near their opponents' goal for the chance of scoring. Remember (1) you cannot be offside in your own half of the field, or (2) if you are behind the ball when it is hit, or (3) if there are three opponents between you and the goal line.

See how you should grip the handle for driving the ball. Your hands should be close together with your right hand behind the stick. The left hand guides and controls the stick, the right hand adds power.

Stand with your left shoulder pointing in the direction you want to drive the ball, and have the ball a little ahead of your left foot. Keeping your eyes on the ball all the time, raise your stick a short way backwards. Now step up to the ball with the left foot, swinging your stick down to hit the ball and moving your body weight forward on to the left foot. Follow through after the ball with your stick in a straight line towards the target, keeping it near the ground. You must not raise any part of your stick above your shoulder either before or after hitting the ball.

The game is, of course, played with the players on the move all the time. Only when taking a free hit or a corner hit will you have the chance of hitting a still ball. It is important therefore

The grip for the push stroke (left) and (right) the grip for the drive.



Taking a penalty corner.

that you learn to hit the ball whilst running, as shown. Only by practice can you learn how to judge the direction and speed of the moving ball and how to position yourself so that you can hit it right.

Hitting on the run.

Some players prefer to keep the same hold of their sticks for driving and for the push stroke. You may, however, like to do as others do and move your right hand down the handle for better control, as shown.

This stroke is very useful for making short quick accurate passes. Place your stick close behind the ball as shown and then lean forward and push

The goalkeeper ready to use her stick, hand or feet.

the ball away from you. Do this by straightening your arms quickly. The ball should always travel close to the ground.

Dribbling the ball means running with it under control. Keep the ball close to your stick by giving it small taps as you run as fast as possible. Keep your stick upright and watch the ball carefully all the time. You can only become skilful if you practise frequently. Remember that you must keep your right hand behind the stick and reach well forward with the left in order to keep the ball away from your feet.

The rules state that the ball shall not be stopped on the ground or in the air by any part of the body except the hand. It must be released into play *immediately*.

In the drawing you see how to stop a low bouncing ball with your hand. It should not rebound forward.

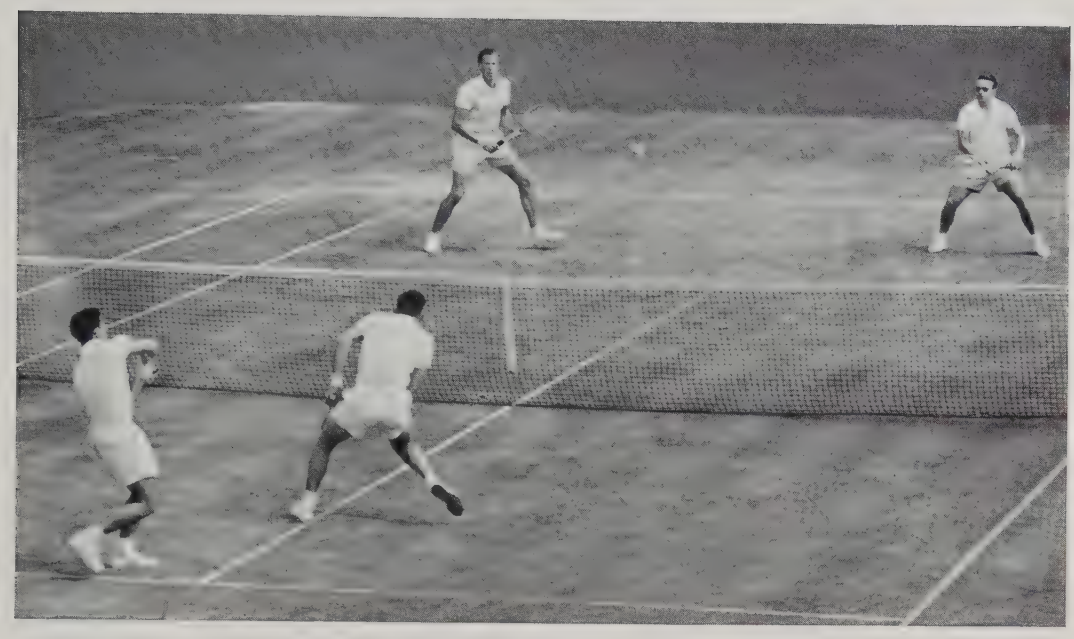
When stopping a high ball with your hand you must be very careful indeed that you release the ball immediately and that it drops straight to the ground under your hand. This is difficult to do correctly and unless you do so you will be penalized by the umpire.

Tackling is trying to take the ball from a player and there are several rules to make sure that the tackle is quite fair. You must not, of course, interfere in any way with your opponent's stick.

To get the ball, watch your opponent very carefully so that you move in to get the ball just as your opponent has pushed the ball forward or is off guard.

When the goal is being attacked the goalkeeper should stand about 3 feet in front of the goal line and be ready to stop the ball with her feet and legs, hand or stick in an emergency, and then should try to kick the ball clear of the striking circle.

When you stop a low bouncing ball with your hand the ball should drop straight down to the ground.



An exciting moment in a men's double match on the centre court at Wimbledon during the All-England Championships.

(11)

LAWN TENNIS

THE game is played between two players ("singles"), or four players ("doubles") when there are two players on each side. The players, each with a racket, stand on opposite sides of the net and take turns in hitting the ball across the net. This they must do before it bounces a second time. The ball must be hit so that it bounces (or would bounce if allowed to do so) inside the court. A player is not allowed to hit the ball twice before it crosses the net. The play is continued (called a rally) until one side fails to return the ball properly and loses the point.

A good racket is made from specially selected wood and is tightly strung with cat-gut or nylon. Your racket should be the correct weight for your size and strength and you should be able to grip its handle easily. Here is a guide: Children aged 8–10 years require an 11 ounce racket. Those aged 10–14 years, 12 ounces; and over 14 years $12\frac{1}{2}$ ounces.

Buy the best you can afford and then make sure that it does not get wet. Always keep it in the press when you are not using it.

Tennis balls are made of rubber and covered with wool and nylon. They must bounce well, and a ball is of little use if it does not bounce over your head when you throw it down with force on to the ground.

The diagram shows the depth and height of the net. You can easily test the height of your net at the middle by placing your racket sideways on top of your partner's racket standing upright on its handle.

The method of scoring is the same with "singles" and "doubles" games. Both sides start with the score 0–0 or "love all" as it is called. The first point scored is called "15" and if the same player scores again then it is "30." If he scores again it is "40" and then again it is "game." The server's score is always given first. Thus if A is serving to B and wins the first point, then the score is 15–love. If B wins the next point then it is "15–15" (usually called "15 all") and so the game goes on. Now if A and B each score three points the score will be 40–40 but this is never called. Instead the word "Deuce" is used which means just this. If A is serving and wins the next point the score is "Advantage Server." If he scores the next point then it is A's game. If on the other hand when the score is "deuce," B wins the next point the score is called "Advantage Striker," and if B wins the next point he wins the game. Whenever the player with the advantage wins the next point he wins the game. Thus the play goes on until one side gets two points ahead.

The singles game is played using the inside "tram lines" as the side lines of the court. This makes a court 78 feet long by 27 feet wide. The height of the net remains the same for both games.

Both server and receiver change by moving sideways left or right across the court after each point has been scored. Each game must begin with the server serving the ball from the

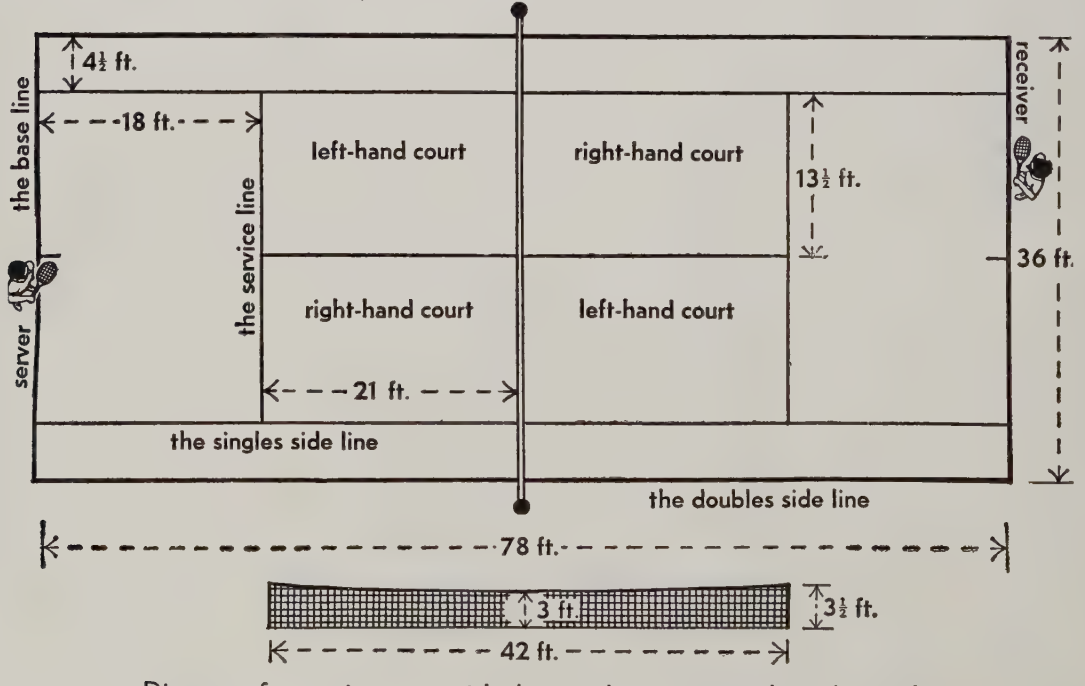
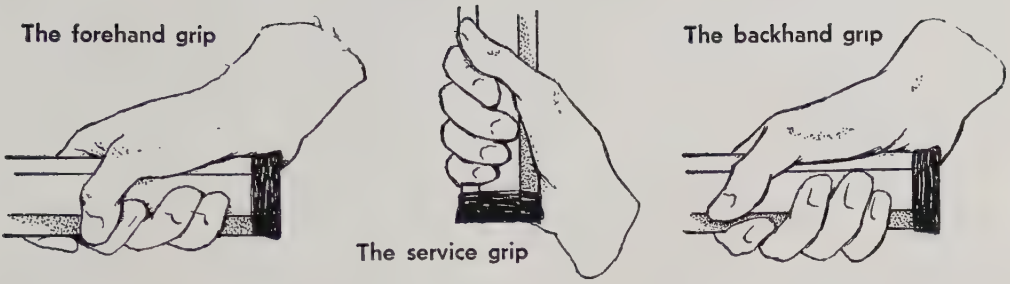


Diagram of a tennis court, with the net shown separately underneath.



If you wish to improve your game try to use the three grips shown here for these three strokes.

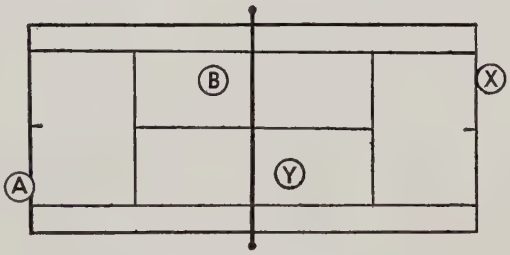
right hand court diagonally across the court to the receiver in his right hand court.

The doubles game is played between two pairs using the whole of the court. Suppose A and B are playing X and Y. A starts to serve which he does from the right hand side of his court. He serves to X who plays it back over the net. Now either A or B can return the ball and either X or Y can play it back again. After each point A and B change sides of their court (left and right). At the end of the game either X or Y serves from their right-hand court and so on.

An easy method of learning the correct way to grip your racket is to turn it on its edge and then to take hold of it as you would a hammer. Use this grip whenever you use the forehand drive. This means that you stand sideways to the oncoming ball with your left shoulder forward and draw your right arm back before bringing it forward again to hit the ball into the opposite court.

Stand sideways with your feet apart, holding the ball in your left hand. Draw your racket arm well back. Now bounce the ball on the ground about one foot away from and directly in front of your left foot. As you do so sweep the racket swiftly round and forward so that you hit the ball hard at about hip height. Make sure you keep the head of the racket up. Repeat this many times, bouncing the balls each time and watching them hit the centre of the racket.

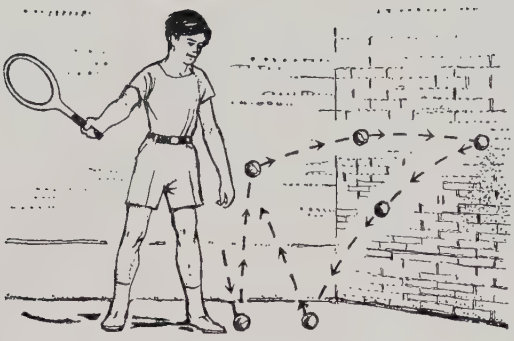
Here is a very useful exercise if you can play against a high wall. Stand sideways 6-8 steps away from the wall. Bounce the ball outside your left foot



Positions in the doubles game.

and hit it against the wall. Allow it to bounce once and then hit it again, and so on. Count the number of times you are able to hit it back to the wall. Here are a number of important things for you to remember. If you keep them in mind and practise a good deal you will in time become a good player.

Watch the ball carefully all the time and especially as you hit it.



Hitting the ball against a wall develops your sense of timing.

As soon as you hit the ball try to judge where it is going to bounce on its return and move quickly into position so that you can hit it back again correctly.

Hit the ball hard each time in the centre of your racket.

Always keep the head of the racket up even if this means you have to bend down very low to do so. It is quite wrong to scoop the ball up. Avoid doing this at all costs.

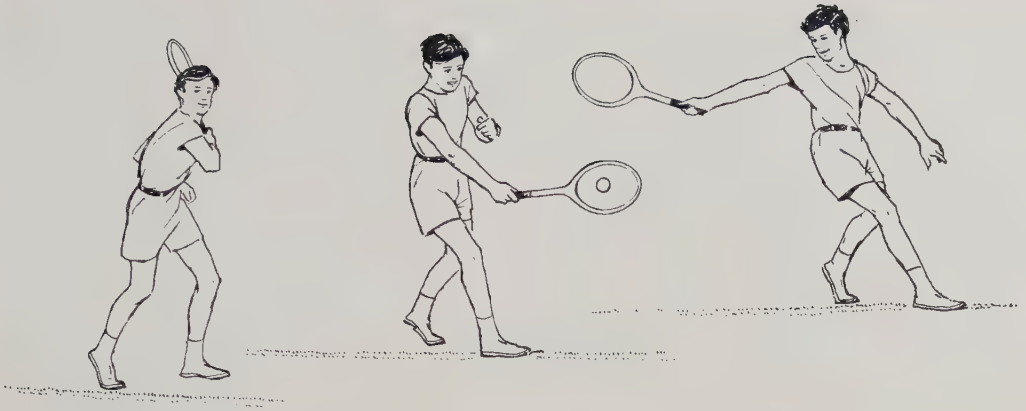
When you have become skilful and can keep the ball going for a rally of 50, draw a line along the wall 3 feet from the ground. This represents the net. Now practise until you can do 50 returns, each one hitting the wall above the line. You are now quite ready to go on to a court.

If you have not got a suitable wall then you will have to practise with a partner who is a good player, for his job is to return the balls which you hit, back to you so that *you* can hit them. This is not easy. You should start the rally each time by bouncing the ball in front of your front foot, and then moving quickly into the sideways on position to send it back again. Keep the score of your best rally.

You should get into the position as shown as your partner gets ready to hit the ball. As soon as he does so you should move quickly into a hitting position so that you can send it back again. Try to hit it so that he also can return it to you and so on. This is called "keeping the ball up" and it is a very useful practice.

You have been learning how to do the main stroke in the game. It is called the forehand drive and here is a picture of how you should try to do it. First of all remember how important it

Three stages in the forehand drive, the main stroke of the game.



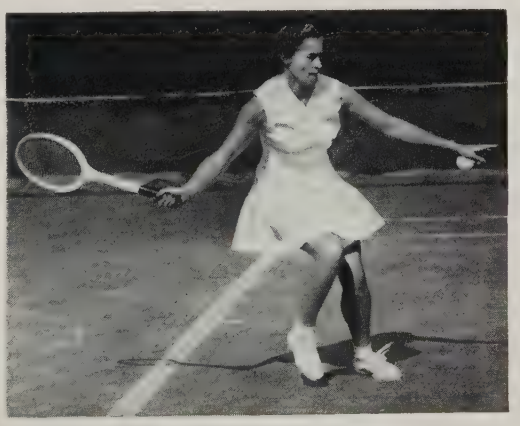
The backhand stroke, like the forehand, requires a good follow-through.

is to watch the oncoming ball carefully and move into position so that you can play the stroke correctly. Notice the sideways-on position, and the arm drawn right back with the body weight over the back foot. As she hits the ball she moves her weight forward on to the front foot and hits the ball when it is opposite her front foot. Note how the racket head has been kept well up all the time and that she has made a good "follow-through" after hitting the ball.

The grip for the backhand strokes is slightly different from that used for the forehand strokes. Turn your racket slightly to the right and place your thumb along the back of the handle.

In performing the backhand stroke stand with your feet apart, sideways, with the shoulder of your racket arm (right) pointing in the direction in which you are going to hit the ball. Your shoulders should be turned completely round. Your helper should stand in front of you and bounce the ball opposite and about one foot in front of your front foot (right). As he does so you swing your racket round and forward so that you hit the ball hip height and opposite your right foot. Swing your arm well forward in a good follow-through. Do this many times and then practise the stroke at a ball coming towards you either hit by your helper or coming off the wall. Do not get too close to the ball.

Here is a good example of the backhand drive. You should try hard to do it well if you wish to become a good player. Move into position quickly and draw your racket arm well back as shown. Keep the head of the racket up. Hit the ball hard and complete the stroke with a good follow-through.



Preparing to make a forehand drive.

Making a backhand stroke.

The service is very important. First of all you must be able to throw the ball up straight. Stand sideways, feet apart, the ball in your left hand. Throw the ball up so that it goes high above your head, and as it does so lean backwards and watch it carefully. When it falls to the ground it should bounce just in front of your front foot. When you throw the ball up see that it goes higher than you can stretch with the front edge of your racket. According to the present foot-faulting rule a player, while serving, must not walk or run and he must not touch, with either foot, the base line or the playing surface of the court until the service is completed. He can jump while serving.

Here is a series of pictures of the complete service. The racket sweeps down, round and back in a circular movement. It then rises and the head of the racket drops behind your head and then is lifted up again to hit the ball with great force at a point as high as possible above the head. Notice the complete follow-through and how the body weight has been forced forward over the front foot as the racket hits the ball. Now go to a court and practise serving 6 balls one after the other. If you are hitting the ball over the base line then you are throwing up your ball too far back. If you persist in hitting the ball into the net, then you are throwing it up too far forward.

For a good service hit the ball hard at the highest point above your head.

A shot at goal being taken during a netball match. This is always a tense and exciting moment for players and spectators alike.

(12)

NETBALL

NETBALL is played between two teams, each having seven players. The aim is to throw the ball from player to player until it reaches either of the two shooters inside the shooting circle. This player then tries to score a goal by throwing the ball so that it passes over and through the ring on the goal post.

A netball is used, which is a leather or moulded rubber ball, between 27 and 28 inches in circumference, and between 14 and 16 ounces in weight.

The game is played on a suitable hard surface such as tar macadam or wood, and should be marked out as in the diagram. The goals are 10 feet high with a ring 15 inches in diameter projecting horizontally from the top of the post and 6 inches from the supporting surface.

The diagram shows the division of the court into three areas by two lines. These areas are called thirds, two goal thirds and a centre third. There is a semicircle marked in each goal third and known as the shooting circle.

Play consists of four quarters of 15 minutes each with short resting intervals between the quarters. Teams change ends each quarter. The time for play is shortened for school matches and tournaments and then consists of two halves of either 15 or 20 minutes.

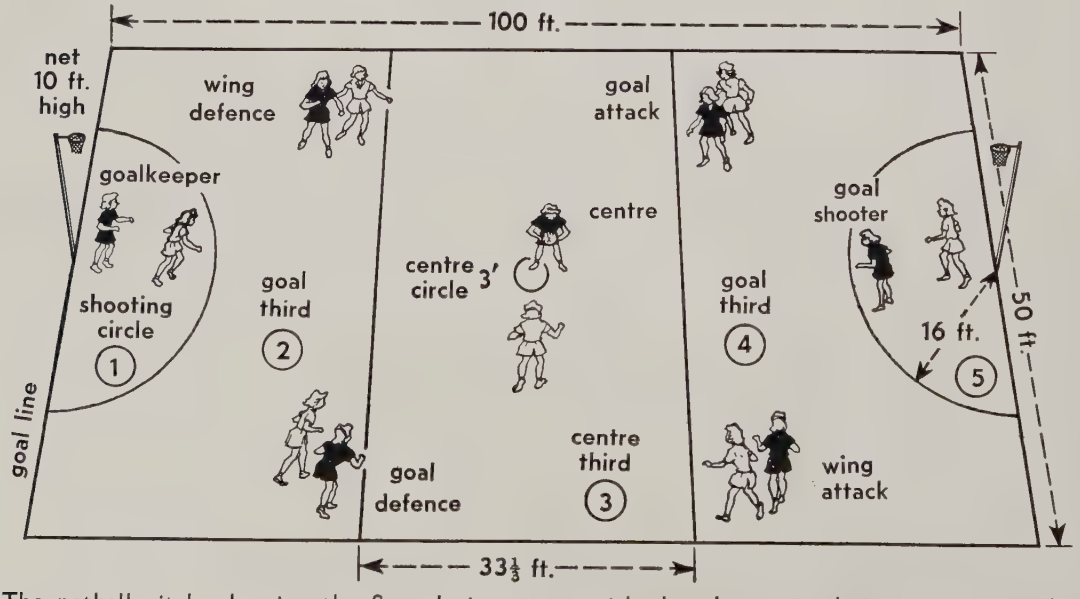
Before the start of the match the teams line up in the positions seen in the diagram. This also shows the names of the playing positions. Goal Shooter stands in her shooting circle, and Goal Attack and Wing Attack in the same goal third. The Centre is in the centre circle waiting for the ball, while her opposing Centre is anywhere in the centre third outside the centre circle. Wing Defence and Goal Defence stand in the defending goal third, and the Goalkeeper in the shooting circle at that end.

To start the game, the Umpire gives the ball to the Centre in the circle—from this moment, all players are free to move about in their own thirds. When the whistle is blown the Centre passes the ball to a player on her side who must receive the ball in the centre third. The ball is then thrown from player to player, and so into the shooting circle to score.

The overarm shoulder throw.

Each player in a team has a restricted area of play :—

			areas
Goal Shooter	plays in		1, 2
Goal Attack	,,	,,	1, 2, 3
Wing Attack	,,	,,	2, 3
Centre	,,	,,	2, 3, 4
Wing Defence	,,	,,	3, 4
Goal Defence	,,	,,	3, 4, 5
Goalkeeper	,,	,,	4, 5



The netball pitch, showing the five playing areas, with the players in their positions at the start of the game.

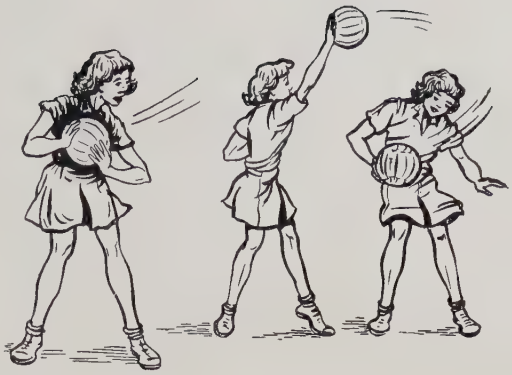
A player is offside if she enters any other area than those laid down for her.

The ball is out of play when it touches the ground outside the court, or is held by a player in contact with the ground outside the court. When this happens, a player in the team opposite to the one who last touched it, must take the ball and throw it to a player on the court, from a position outside the court where the ball went out.

The throw-in.

The ball may not be thrown over a complete third of the court, that is to say over two of the lines, without being touched by a player in that third.

There is a time limit of 3 seconds when holding the ball between catching and throwing it, or when shooting to score. There is also a limit to foot movement during the interval between a catch and throw. When a player runs for a ball and jumps to make her catch, she may land on one foot, put the other foot down as in a step, or move it about to turn around; she may lift the first foot off the ground but not complete a step with it. The penalty for breaking these rules is a free pass to the other team.



Three ways of catching a ball.

A player may catch hold of the ball in any manner, and throw it in any manner. The greater the variety of these skills used, the less likely it is that the pass will be taken by an opponent. She may attempt to intercept any pass or shot for goal, so long as she is at least 3 feet away from the thrower, and does not interfere with her throwing or shooting action. Neither may she make contact with an opponent. As this is likely to make the game rough or dangerous, it carries the biggest penalty—a penalty pass in which the guilty player must stand

Pivoting to change direction.

beside the player who makes the pass. If a defender in the shooting circle fouls a shooter, then a penalty shot, taken in the same way as a pass, may be taken.

After a team has scored a goal, all players return to their starting thirds of the court, but they do not have to stand still in the position shown for the line-up. They may stand or move about in any part of that third providing it is part of their playing area.

A free throw.

The whistle is blown to restart the game just as soon as the centre due to make the next pass is in the centre circle with the ball, and the other players have moved across the line out of the centre third. The centre pass is taken alternately by each centre throughout the game.

Before seven players can combine together to make a number of passes that end in a goal, each must learn the basic skills of the game. These are throwing and catching, freeing herself from an opponent, marking an opponent, interception of passes, and shooting. These skills can be learnt and practised in small numbers on a court or even alone. Daily practice in shooting goals is necessary to become accurate from all parts of the shooting circle.

In a game, not only must a team be able to attack by means of passing the ball and then score, but it must also be able to defend, that is to prevent the opposing team from scoring, by marking closely and taking the ball in the air. When this happens, a team attacks again with a new chance of scoring.

There are two umpires in charge of a game, who start and restart the game after goals are scored, and give decisions and award penalties, as well as keeping the score.

(13)

RIDING

RIDING can be learnt at a very early age and, unlike nearly every other sport, enjoyed all through a long life. It is easy to learn and does not take very long, but it requires a lot of practice to become a good rider. The more time spent on a pony or, better still, a number of different ponies, the more skilful the rider becomes. To be a fine horseman is a great and proud accomplishment.

The way to sit on a pony is simply told. Sit down as close into the saddle as is possible, with the legs dangling to their full length, then adjust the stirrups so that the bottom of the

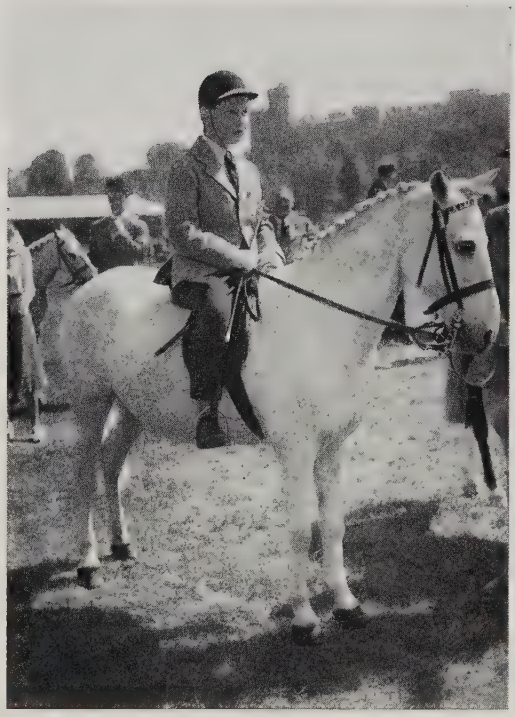
stirrup iron touches the ankle-bone, draw up the knees and place the ball of the foot on the base of the iron. The learner should, however, put the foot right home, and only when more experienced, use the ball of the foot. The knee must always be kept pressed on to the saddle. The toes should be slightly tilted up, turned out, with heels a little down and, as though the rider is sitting in the centre of a large clock, the toes should point to seven minutes to the hour and seven minutes past.

The body must be held upright, the head high, and the rider looks to the front. The back must be slightly hollowed, but must not be stiff. The elbows should fall lightly to the sides. At the trot the body is pushed up from the feet, and knees, and must move up and down *all in one piece*, easy and supple. At the canter and gallop the seat remains close to the saddle.

The reins must be held lightly (not squeezed by the fingers) and light contact always kept with the pony's mouth. This means "light hands," yet not too light. If the bridle has but one rein this is passed round the outside or inside of the little fingers of each hand. If two reins each passes outside and inside each little finger.

Chief aims in riding are to sit correctly, comfortably balanced, and safely, and to have control at all paces. These are the walk, trot, canter and gallop, which is the same as the canter, but faster. Some ponies are easy to control, some difficult ; only the experienced riders can manage the latter. When this is done it gives great satisfaction, for all ponies are very strong.

After the early lessons and when some confidence has been gained, one golden rule must be observed. The rider must be patient and try to understand the mind of the pony, and never



It is never too early to start learning the art of good riding. This youngster and his pony look smart, comfortable and safe.

lose his temper, and *always insist on being the master*. If a pony is wilful and headstrong he must be made to obey by repeating what is required over and over again, with kindness, but great firmness. In thus teaching the pony, the rider will be teaching himself one of the great lessons in horsemanship.

(14)

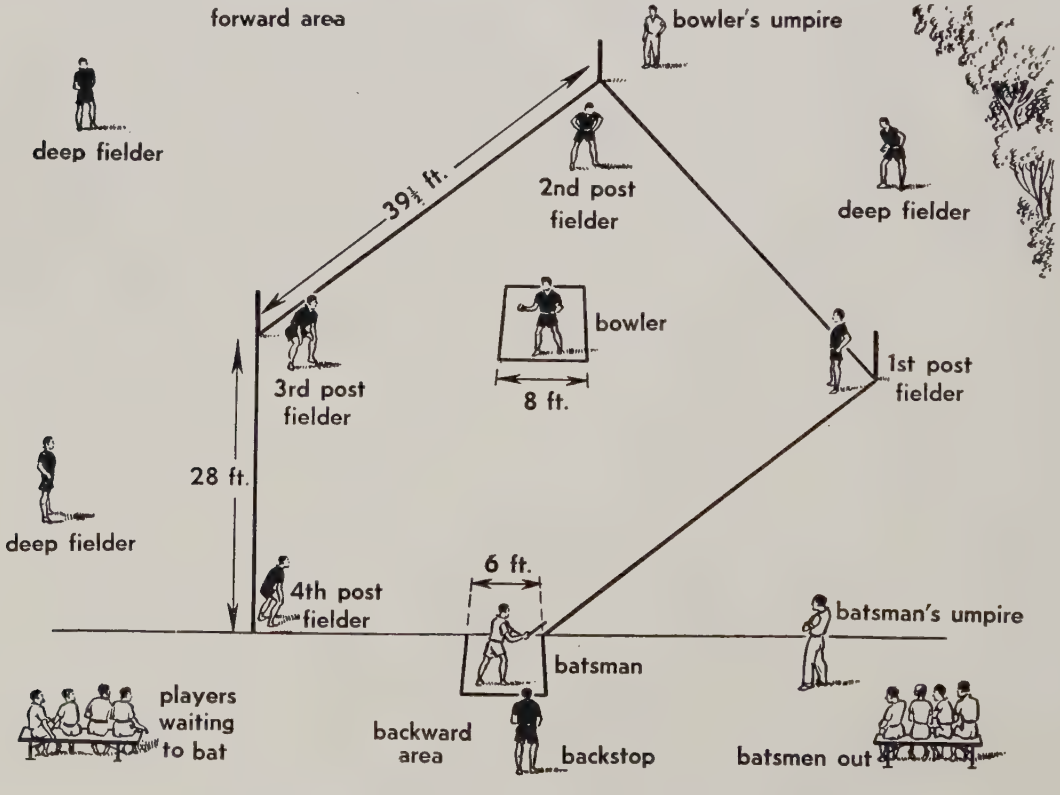
ROUNDERS

THIS game is played between two teams. The teams, each of nine players, take turns in batting and fielding. The object is for the batting side to score rounders by running round the track outside the bases. The team which scores the greater number of rounders is the winner. Rounders is an especially popular game with girls and women.

Look at the diagram and you will notice that there is a batsman's square (in which the batsman will stand) and a bowling square, from which the bowler must bowl the ball, and four posts or bases. Note also that the dotted line marked across the field divides it into a "backward area" behind the batsman's square and a "forward area" in front of the batsman's square. Each base is marked by a post four feet in height.

The ball has a firm hard centre. It is wrapped with cotton and covered with fine calf leather. It weighs nearly 3 ounces and is smaller than a tennis ball.

A stick is used for batting. It is 18 inches long, round, and of wood. It is very dangerous for the batsman to fling the stick back in running off round the course. Several sticks should therefore be provided.



This diagram shows you a rounders field with a game in progress.

Two teams of girls enjoying a serious game of rounders.

The diagram shows where the fielding team should take their positions. Note that there are a bowler, one backstop, four post fielders, and three deep fielders. The bowler's umpire stands behind the bowler and the batsman's umpire in line with the dotted line dividing the forward from the backward area.

The players awaiting their turn to bat must keep well back and to the left of the backstop. The batsmen who have been put out must also keep well back and away from the backstop.

When all is ready and number 1 batsman is in his square, the bowler bowls with an underarm action, a ball which must go between head height and knee height of the batsman. It is a "no ball" if the bowler does not keep both feet inside the square until he has released the ball or if it is not on the hitting side of the batsman. It is also a "no ball" if it is too wide for him to hit or if it goes higher than the batsman's head or lower than his knees.

Each batsman is allowed one good ball only and whether he hits it or not he must run to the first post and beyond if possible. If he wishes to do so he can run off a "no ball," and he can also hit a "no ball" but he cannot be caught out off a "no ball."

The batsman must keep both feet inside the square whilst batting. He must run to the first post as soon as he hits or tries to hit or even lets pass the first good ball. He must run round the outside of the posts but he must not overtake any other batsman running in front of him. A batsman running round the posts can be put out by a fielder, holding the ball in his hand and touching the post to which he is running before the batsman touches it. He can also be put out between the posts if a fielder, with the ball in hand touches him as he is running from one post to the next.

A rounder is scored when a batsman having hit the ball succeeds in running completely round to the 4th post before another ball is bowled. A half rounder is scored if the batsman succeeds in getting round to the 4th base without hitting the ball. A penalty half rounder is awarded to the batting side if the bowler delivers three "no balls" one

after the other to the same batsman, or if a fielder gets in the way of a batsman whilst running between the posts.

Only one batsman can be at a post. The player who batted first must be made to run on. No batsman is allowed to return to a post unless he has over-run it and could not stop in time, or the umpire orders him back.

If a batsman hits the ball behind the line (to bounce in the backward area) he must run to first post, and wait there until the ball has been returned over the line. If the ball is mis-fielded he can then run on and score half a rounder if he reaches 4th post. When there is no batsman awaiting his turn to bat, all the batsmen running round the bases can be put out at one go by the ball being thrown by a fielder into the batting square before one of them has reached the 4th post. The ball must bounce for the first time inside the square.

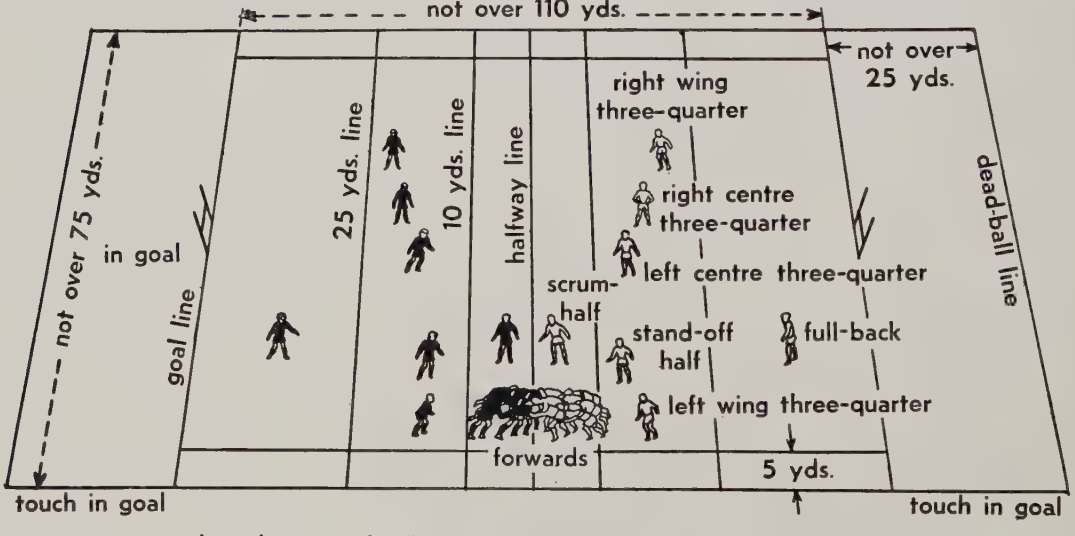
(15)

RUGBY FOOTBALL

THERE are two forms of Rugby played in Great Britain and some other parts of the world today. They are called Rugby Union and Rugby League. We shall deal with the older variety, Rugby Union, first, and later describe some of the chief differences between that and Rugby League.

Rugby Union is played between two teams each of 15 players. The team which scores the greater number of points is the winner. Points are awarded as follows: a try scores three points, a goal scored from a try five points (in which case the try itself does not count in points). A goal scored from either a free kick, penalty kick or dropped goal scores three points.

A try is scored when a player with



A rugby union football field showing dimensions and players.

the ball places it on the ground in his opponents' goal. A goal is scored by a player kicking the ball over the cross bar and between his opponents' goal posts.

To play this game you need a pair of good boots made from soft leather. Press dubbin well into the leather especially the soles and the welts (the part where the uppers meet the soles). This treatment with dubbin will not only increase their life but more important it will make them waterproof. After each game wipe them clean and re-dubbin them. Keep your boots properly studded. If you lose one or two replace them immediately. Buy a good strong pair of rugby shorts, ordinary running shorts or soccer shorts are useless. The jersey should also be of the best quality.

The game is played with an oval ball. The outer case is of leather and covers an inflated rubber bladder. The following sizes are recommended: 8-10 years old, size 3; 10-16 years old, size 4; 16 and over, size 5.

The 15 players on each side are made up of 1 full back, 4 three-quarters, 2 half-backs, and 8 forwards.

The three-quarters are known as left wing three-quarter, left centre three-quarter, right centre three-quarter, and right wing three-quarter. The two half-backs are known as the stand-off (or fly) half and the scrum-half. Of the forwards there are two wing forwards, and one back row forward (sometimes referred to as "lock"), two second row forwards, two front row forwards, and one hooker.

The ball is kicked off from the centre and must travel at least 10 yards ahead. The opposing team should mostly spread itself over their own half of the field especially where the ball is likely to go when kicked.

Keep your toe well down when punting the ball. In this way you hit the ball with your instep and can control its direction.

In international matches the players wear large numbers on their backs. They are numbered as follows: (1) full-back, (2) left wing three-quarter, (3) left centre three-quarter, (4) right centre three-quarter, (5) right wing three-quarter, (6) stand-off half, (7) scrum-half, (8) front row forward, (9) hooker, (10) front row forward, (11) and (12) second row forwards, (13) wing forward, (14) back row forward, (15) wing forward.

The game is controlled by a referee and two touch judges. Each touch judge takes a touch line and helps the referee by standing behind the goal during kicks at goal and signalling whenever the ball has crossed the bar.

A player with the ball is not allowed to pass it forward to a team-mate. Passing therefore must always be in a backward direction. If in approaching

the ball the player propels the ball forward with his hand or arm this is known as a "knock-on" and a scrum is taken. Players, however, can kick the ball in any direction.

If the ball crosses a touch line, even though it is carried over by the player holding it, a line-out is awarded to the team not responsible for the offence. The game is re-started by a player throwing the ball in to the playing area from the place where it crosses the line. The ball must be thrown in at right angles to the touch line and must travel at least five yards before it touches either a player or the ground.

A player may run with the ball in any direction but if he is tackled he must play the ball immediately. A tackle occurs when the player with the ball is brought down and held by an opponent. The rule also states that if a player is so held by an opponent that he cannot pass or play the ball then he is considered to be tackled. It is important to note that after a tackle has occurred the ball can only be brought into play by a player's foot. In other words no one is allowed to pick it up until it has been played first with the foot.

A ball which is kicked or carried over the opponent's goal line and either crosses the dead ball line, or is kicked or cornered across it by a defender, is considered "dead." The game is re-started by the defending team taking a drop kick from the 25 yards line.

There are two kinds of scrum, the set scrum and the loose scrum.

The set scrum is ordered by the referee as a means of re-starting the game when certain rules have been broken. The forwards of each side lock themselves together as shown in the pictures on page 283.

The scrum-half will always put the ball in on the side of a "loose head." This means on the side where one of his front row forwards is on the outside edge of the scrum. There are two types of scrum formation; the 3-2-3 and the 3-4-1. Both formations are used. Some experts claim that the 3-4-1 has the advantage, chiefly because the wing forwards can break more quickly.

The scrum-half of the team which has not broken the rule puts the ball into the scrum. He must stand at least one yard away, throw it from below the knee with both hands, and throw it in such a way that it just touches the ground beyond one foot of each of the nearest players in the front rows of the opposing packs.

A try is scored by placing the ball on the ground inside your opponent's "in goal" area. This scores three

The drop kick.

The Scottish scrum-half gets the ball well away during a schoolboy rugby international between Scotland and England.

points, and also entitles the scoring side to a free kick at goal. The kick is taken with the ball on the ground (usually a member of the kicker's team acts as "placer") from any spot directly opposite the place where the ball was touched down. All the kicker's team must keep behind the ball when it is kicked, and all the opposing team players must keep behind their goal line until the "placer" puts the ball on the ground for the kicker to boot, when they can run forward to try to touch the ball.

Players carry the ball mostly in both hands. You should always hold it so that your fingers are spread down the seams. Unless you are a left handed player, learn first to pass the ball to your left. Keeping your arms more or less straight carry the ball across your hips to the right and as you turn your head to look at your team mate, swing the ball across your body to the left and release it. Thus the whole action is like one you would use when shovelling sand or soil. The pass must of course be made backwards. It should travel straight towards the tummy of your partner. When you can do this well, try to pass to the other side using the same sort of action.

Kicking a still ball.

The punt is the name given to dropping the ball from your own hands and kicking it before it touches the ground. Learn to do this by holding the ball along its seams and pointing it downward. Walking or running slowly, drop it carefully in front of you so that the curved part of the ball contacts your kicking boot. Keep your toe down. Keep your head down, and do not look up to see where the ball has gone until you know it has fallen again.

The drop kick is made by dropping the ball from the hands in front of the body (as in the punt) and kicking the ball either as it hits the ground or immediately afterwards. This kick requires a great deal of practice for you not only must learn how to drop the ball on to its point so that it rebounds towards you, you have also to so time the swing of your kicking leg that your foot hits the ball at the right moment.

To kick at a still ball placed on the ground you must first make the hole for the ball to stand in. If it is a short kick then you make the hole for an upright ball with your heel. If it is a long kick then you make a sloping "U" shaped hole for a leaning ball. Take only two steps run-up for the short kick and four or five steps for the long kick. Keep your head down and follow through with the kicking leg. Use your toe for kicking.

There are several ways of tackling a player but by far the best is from the side and a little in front of the player. Tackle low and thrust your shoulder in to his thighs just above his knees. As you do this grab him round his knees and pull the player towards you.

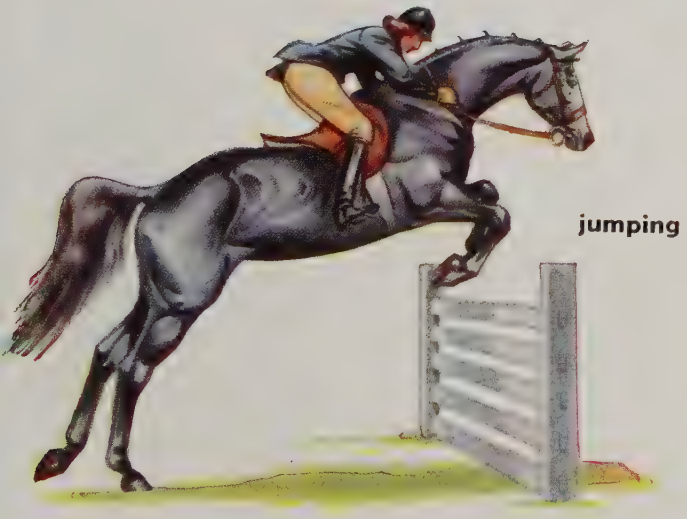
Jumping in a line-out during a match between Oxford and Cambridge.

the trot

the gallop

dressage is a type of training intended to make the horse completely obedient to the rider

this horse is doing a half passage, in which it moves forward in a slantwise direction



jumping

bending

HERE ARE SOME OF THE MOVEMENTS YOU MAY LEARN IN RIDING

a skater cutting a figure

an ice yacht speeding across a frozen lake

rushing down a steep course on a toboggan

smoothing the stone's path in curling

an instructor introducing his young pupils to the art of skiing

THE SNOW AND ICE OF WINTER ENCOURAGE THEIR OWN SPORTS

In a line-out the wing three-quarter usually takes the throw which he does with a one arm over the shoulder movement for a long throw. He takes a short throw with a two handed "lob" throw.

On page 280 is a picture of the players near the ball jumping to get it. Whoever gets the ball should turn towards his own side and pass the ball back to his scrum-half. Occasionally the player getting the ball may keep it, and turn into the opposing team. When this happens his team mates should get round him and push hard.

Look at the picture of the forwards pushing in a scrum. All have bound tightly, are keeping low and are waiting for the word "now" called out by the scrum-half putting the ball in the scrum. At this signal both teams give a mighty push to try to get and keep the ball.

The first thing to remember is to keep low. The next is to keep your back flat and to do this try always to arch it. A humped back is a weak one and means the player is not pushing

The hooker and two front-row men.

How to push in a scrum.

his weight. It is most important for every player to push his weight if his team is to get the ball and get it back quickly to the waiting scrum-half. Note also that you should have one foot in front of the other.

As soon as the referee marks the spot where a scrum is to take place, the hooker should run there and stand with his arms raised above his head. He should be quickly followed by the two front-row men who grasp him round his body. The hooker then grasps them firmly over their shoulders. The others get down as soon as they can and bind tightly.

Rugby League, as opposed to the Union variety, is generally played by professionals, although more and more amateurs are taking it up. It flourishes mainly in the north of England, in Australia and New Zealand, and in France. In many respects the League form of rugby is the more open of the two games, and today attracts vast crowds.

There are several important differences between the games. To begin with, the League game is played with 13 men instead of 15. Points awarded for a try are three in each case, but in

The giants of Rugby League football fight it out during a Cup Final.

the League game a goal is only two points, regardless of the type of kick.

When a place-kick is being taken to convert a try into a goal, the opponents in the League form of rugby must stand still until the ball has been kicked; whereas, in the Union form of rugby, once the ball has touched the ground prior to the kick, the opponents can rush straight at the kicker, hoping to put him off. Although the rule that the ball may not be touched with the hands after a successful tackle (it must be brought into play by the feet) applies to both games, in the League game when a player is tackled he keeps the ball, gets up and drops it on the ground just in front of him to bring it into play again.

One last difference is that if a ball is kicked direct into touch without first bouncing in the field of play in the League game it must be brought back for a scrum at the spot from which it was kicked, so that this move is of no advantage.

(16)

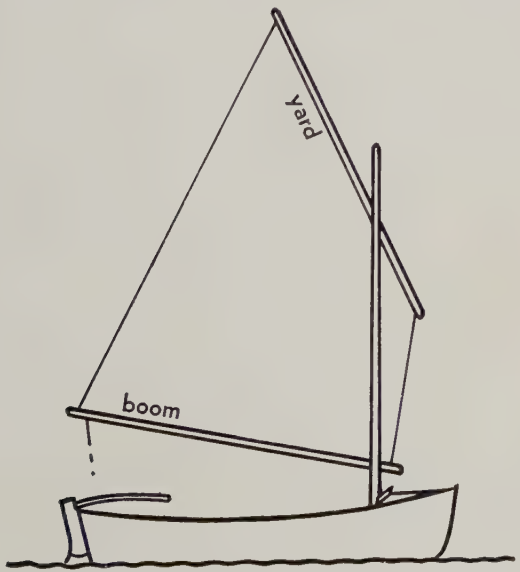
SAILING

BEFORE venturing on the water in any sort of sailing craft, for your own safety you must be able to swim at least 50 yards, and you should *always* wear a life jacket when afloat. Only then can you begin to appreciate what a lot of fun is to be got out of sailing a boat. By your own skill and at no cost for fuel you make the wind take your craft where you want to go. Another thing—it is easy to learn to sail, and you will soon be getting

results, yet you can never really finish learning, and there is always the thrill of doing the job just that little bit better.

The best boat to learn in is a dinghy with a single sail. When you can sail this properly, you will find no difficulty in sailing a bigger boat, as the principle is the same, however many sails you have. The general-purpose dinghy often has a balanced lugsail. A livelier boat will have a gunter, and a racer has the very tall Bermudan sail. All of these may have a triangular foresail in front of the mast. With one sail only the boat is una rigged. With the addition of one foresail it is a sloop. A yacht with more than one sail in front of the mast is called a cutter.

Besides the mast and sail, the dinghy will have a rudder controlled by a tiller, and there will be some sort of keel. This may be fixed, but usually in a dinghy it is retractable in a casing



General-purpose dinghy with a balanced lugsail.

Two members of a sailing club taking advantage of the breeze.

—called a dagger board when it slides up and down and a centre board when it is hinged into the casing. The keel surface is not there to stop you turning over—your own weight in the right place does that. It stops you being blown sideways through the water, called "making leeway."

If possible, hoist the sail while the boat is still moored to the bank. Let the boat float bow to wind, so that the sail flaps like a flag. Do not pull in the "sheet," the rope controlling the sail, until you have cast off the bow painter. The boat will drift back, then swing to one side and the sail will fill.

If you are alone you will have to sit about halfway along the boat to trim it properly. The boat will not sail properly if either the stem or stern is too deep in the water. If there are two of you, your crew sits in the bottom of the boat forward, while you sit on one of the side benches towards the stern. Most boats sail best on an

Two youngsters enjoying themselves in a race for sailing boats.

even keel. In a strong wind you and your crew will have to be prepared to move about to keep a correct balance.

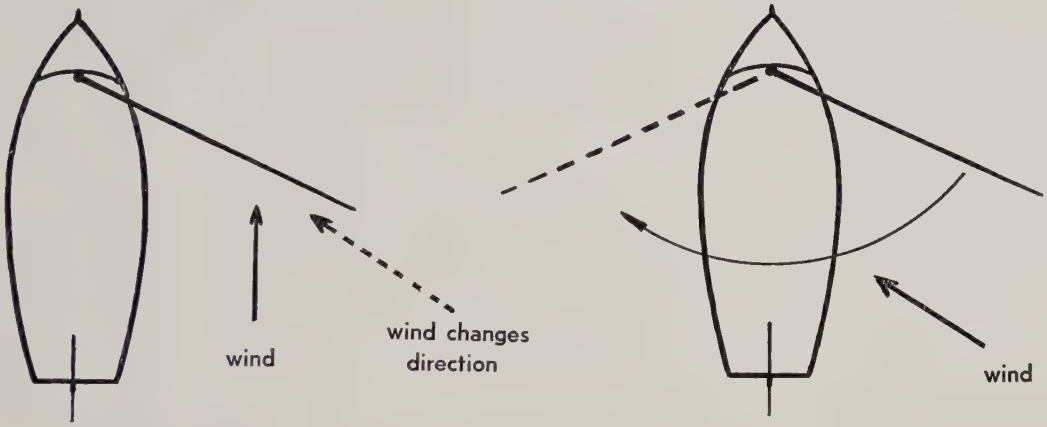
It is usual for the helmsman to sit to windward (the side opposite the sail), with the tiller in one hand and the sheet in the other. If there is a crew, he (or she) looks after the centre board and the foresail sheets, if any, but his main job is as movable ballast.

The direction you will sail is controlled mainly by the angle at which you set the sail—the rudder is only a secondary control. Of course, it is impossible to sail directly into the wind, or to a certain angle each side of that. This varies, but you can assume it is about 45 deg. Sailing as near to the wind as possible is called "close hauled," at right-angles you are "reaching", and with the wind aft you are "running."

Sailing close hauled is most thrilling, and actually one of the safest directions, because in an emergency you turn the bow right into the wind and the air is spilled from the sail. To sail to windward, you haul in the main sheet so that the boom is almost in as far as it will go. In a properly designed boat there will be a tendency to try to turn into the wind, which you correct with the tiller. If it does not, move your weight a little farther forward. Turning away from the wind could be dangerous.

To get to a place to windward you have to sail a zig-zag course, called "tacking." At the end of each "board" you give the order "ready about," then turn the bow up into the wind and you and your crew change sides, ready for when the sail fills on the other tack.

Reaching is similar to tacking, but the sail is let further out. Running may seem simplest, but you have less control in that direction. The boom is right out. As you are moving with the wind you do not get the same sensation of speed. It is best to avoid sailing with the wind exactly aft. It is better to have it a few degrees to one side and the sail out the other side. The reason for this is the danger of a "gybe." If the wind is aft and it changes slightly or is reflected from trees so that it catches the wrong side of the sail, the boom will lift and crash across to the other side. If this is unexpected, it may do damage or even capsize the boat. Sometimes, as when following the bends of a river, a gybe is deliberate. In anything but a strong wind this can be a safe manoeuvre. However, if there is room, it is safer to get the sail over by tacking, making a complete circle into the wind. This may take longer but it could save your crew from a wetting.



A slight change in the direction of the wind, when you are running, can cause a gybe.

(17)

SKATING

WHEN learning to skate you should ask the help of a friend who can skate already. Stand side by side holding hands. Some skaters cross their arms in front. You will soon discover that to propel yourself forward you must get off the "flat" part of your skate. Now turn your feet out, keeping your body weight well forward and slide forward first on one foot and then on the other with long smooth movements. You will find that you are using the inside edges of your skates and that you can get quite a push from each skate in turn. Keep your head up all the time.

Next time you visit a rink watch an expert skating forward. He moves forward on each foot with a curved

A young figure-skating champion in action.

outward sweep of several yards. He keeps his arms down and although they act as balancers he keeps them under good control.

Figure skating is a very popular sport and world championships are held every year. Skaters are able to perform wonderful feats on the ice requiring great skill and body control.

For speed skating special skates with long thin blades are used. The body is bent forward and the action is very similar to that of fast walking, with the arms swinging from side to side.

(18)

SKIING

The sport obtained its name from the long wooden shoes which are used and which are strapped to the feet. The length of the skis varies according to the height of the wearer. A rough guide is that the skis should be 1 foot longer than your height. The skis are made from wood like hickory or ash, and are no more than 5 in. wide and about 1 in. thick. The front part is turned up for about a foot. The skier also wears specially shaped boots made from stout leather. He also uses a stick in each hand to help to push him along. The sticks are 4–5 ft. long. Each has a sharpened point above which is a metal disk to prevent it from sinking into the snow. Wax and oil are used to keep the skis highly polished so that they will glide smoothly over the surface of the snow.

When you begin to move along level ground, the skis should glide over the

What you need for skiing.

Even tots like these can enjoy the thrills of skiing.

snow without being lifted. Do not bend forward but lean well forward. Keep your front knee over your front foot each time and take long sliding steps. Use each stick in turn with the opposite foot.

Ski-ing competitions are held in many countries, and in them men sometimes race over distances up to twelve miles.

Another form of competition on skis is ski-jumping. Sportsmen from all over the world come to the famous Holmenkolden meeting near Oslo in Norway. The take-off for the jumping has been built into a hillside. Each jumper in turn speeds down the specially constructed "hill" and then thrusts himself into the air. He has to keep his balance and land on both feet.

(19)

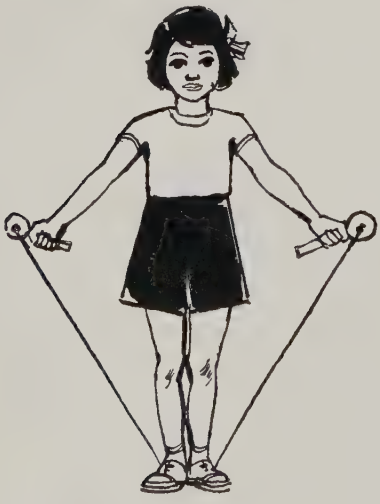
SKIPPING

SKIPPING can be done either with a long rope that can pass under your feet when your arms are stretched sideways or with a short rope. Ladies who skip in "keep fit" classes always use the long rope, and indeed skipping with a long rope is more graceful. Children who skip during school playtimes and at home for their own amusement prefer the shorter rope. Boxers who use skipping as a means of training, also prefer the short rope.

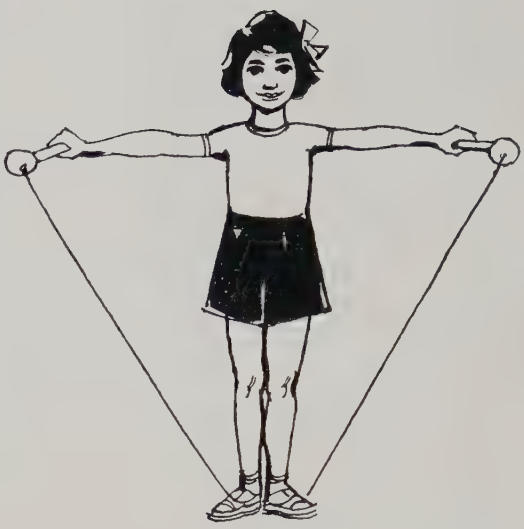
First you should aim at skipping as gracefully as you possibly can. As you spring stretch your body and especially your ankles and knees. Do not spring high. Indeed, if you are turning your rope correctly you should only have to spring a little higher than the thickness of the rope. It is most important to learn to turn the rope so that it touches or just misses the floor immediately under your feet. Careless turning of the rope often causes it to hit the ground in front of the skipper's feet and rebound so that she has to jump much higher than she should.

To do this you must turn the rope fairly quickly and spring with each turn. You should practise turning the rope forward and then again turning it backwards. Remember to do light springing movements making very little, if any, noise with your feet. Count your skips. After a while you will be able to do 100 without a break.

In carrying out slow skipping you must make a spring then a rebound—which is a very low spring with a little more "give" at the knees. It is called "slow" because the rope turns slowly, passing under the feet only when each skip is made and not during the rebound. Learn to do this with the rope turning backwards as well as forwards.



Skipping with a short rope.



Skipping with a long rope.

To practise running skipping forwards, you merely run forwards turning the rope forwards as you go. You should bend your legs slightly backwards from the knees.

To do this backwards you turn the rope backwards and raise each knee slightly in front. Note that you should also point the toe down.

It is easier to skip with arms crossing by turning the rope backwards than it is turning it forwards. In each case cross your arms in front of your body.

There are many different ways you can skip in the same rope as a friend.

Here are some of the ways. (*a*) Stand with the rope in your hands and with the loop on the floor behind you. Your friend should stand in front. Now you turn the rope forward as you both skip

keeping time with the turning rope. Now try turning the rope backwards. (*b*) Stand side by side with your arms around each other's waists, and each holding one end of the rope. Now skip together each using the wrist for turning the rope. Now try coming out of the rope one at a time. As you do so remember to face forwards all the time.

If you want to skip in a long rope you require a strong rope about 8 yards long. So much depends on the two whose job it is to turn the rope. They must turn it evenly and just skim the ground with the loop of the rope. It is great fun to run in, skip, and get out again.

Three skipping in one rope.

(20)

SWIMMING AND DIVING

If you cannot swim and you are visiting the baths for the first time, here is a simple little exercise which will help you to get used to the water. Walk down the steps, at the shallow end of course, take hold of the rail or scum trough, with both hands and stand facing the bath side. First jump up and down, trying to jump higher each time. Now bend your knees and drop well down in the water until the water is up to your chin. Now try taking a deep breath, and, keeping your mouth tightly closed, go right down under the water.

The legs are very important in many swimming strokes and you can only learn how to use them well if you practise the movements correctly over and over again. Here are two ways in which you can hold yourself along the surface of the water so that you can practise the leg stroke. The first way is to place one hand over the rail and press against the bath wall with the palm of the other hand. Both arms should be straight. The second way is to grasp the scum trough with both your hands and press with your elbows against the wall. In both cases lie still with your shoulders under the surface of the water, feet together, ankles stretched.

Now for the leg stroke itself. The legs should move up and down without stopping, the heels just showing on the

The first dip of the day—and nobody wastes any time.

surface. There should be no splash. Stress the upward movement, keep the knees nearly straight, and stretch your ankles.

To learn the arm stroke it is best to practise first keeping the arms in the water all the time. Stand with your knees bent and the water covering your shoulders. Walk about pulling yourself forward with long straight strides.

After a great deal of practise combining the leg and arm movements you should be developing a useful "crawl" stroke. Note that the legs keep going up and down all the time driving the body forward like the propeller of a ship. Each arm enters the water 12 inches from its shoulder, slides forward a little and then presses down, pulls, and finally pushes the water. You should turn your head slightly to one side to breathe with each stroke. Breathe in through the mouth.

Many prefer the back crawl even though it is not as fast as the front crawl. To do this practise the leg stroke first. Start with the back of your neck against the scum trough or rail and then grasp it with your outstretched arms. When along the surface, beat your legs up and down as in the front crawl. Do not splash. Count your strokes.

Now try holding a cork float behind your neck, and lying back in the water. This form of practice is even better than at the bath edge.

Lie back in the water and start a gentle leg stroke from the back crawl. Keeping your arms more or less by your sides, turn them over and push with your hands, then again and again at the rate of about three a second. This is called sculling with the arms.

Stand facing the scum trough or bath rail. Now stretch your arms overhead and at the same time push

vigorously with your legs so that you shoot backwards along the surface of the water. Make sure that you streamline your body in front by keeping your hands together, and behind, by keeping your feet together and ankles stretched.

Floating, especially in salt water, is easy. All you have to do is to take a deep breath and lie still. Your legs will probably sink a little but unless you are very heavy in the water you will float.

The breast stroke is a very useful stroke and well worth learning. When you pull your arms round make sure you press downwards and lift your head clear of the water to breathe in. See that both your knees turn outwards and that when you kick your legs do so really vigorously closing them together at the end of the stroke. As you glide forward at the end of each stroke check your legs. Are they together? Are the ankles stretched? Check your arms. Are your thumbs together?

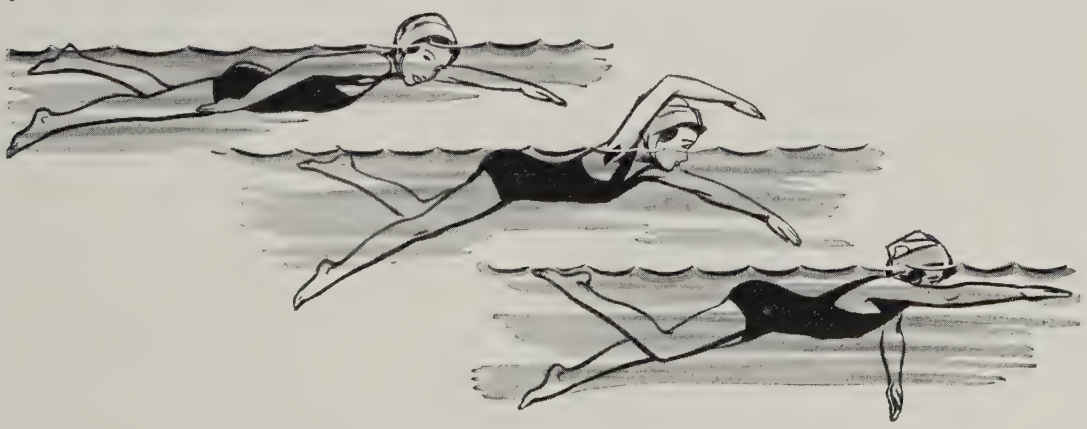
Learning to dive.

DIVING

As soon as you do not mind putting your head under the water you are ready to learn to dive. First stand as shown in the accompanying picture. Cover your ears with your arms and keep your hands together. Make a little spring as you bend forward from the hips. Don't forget to hold your breath as you plunge beneath the surface in a shallow dive.

Stand with your back to the rail or scum trough, and hold with both hands. Take a breath, lower the head and push off just under the surface of the water. To get on to your feet again, raise your head, press down with your arms and raise your knees on to your chest.

Now sit with your feet halfway down the steps. Make sure that you



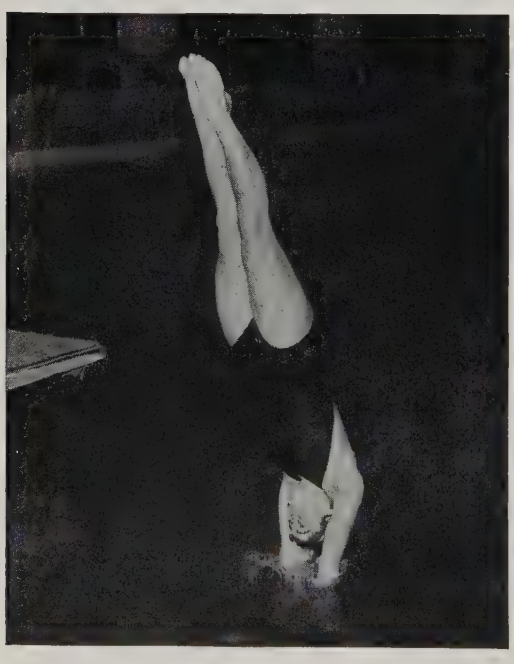
Three stages in the front crawl stroke.

The racing dive—don't start swimming too soon.

cover your ears with your arms and that you keep your head down.

Do the same again with your feet on the scum trough or bath rail. Try to make as little splash as possible. Don't forget keep your hands together and cover your ears with your arms.

Now practise the dive from the crouch position, each time starting from a more stretched position until you can do it from a standing position. Make certain your toes grip the edge of the bath.



A clean entry into the water is the mark of a good dive.

You are now ready to learn the complete dive. First stand with your toes gripping the edge of the bath. Raise your arms forward and then lower them downwards and backwards. At the same time bend the knees slightly and lean forward. Now make a little spring as your arms swing forwards and upwards into the diving position so that you enter the water in an arc. It is important to streamline your body like this so that you enter with as little splash as possible.

Here are three features of a good plain dive which you must constantly bear in mind. Always enter the water as nearly upright as possible. Straighten your hips as soon as you can when you spring upwards and outwards off the diving board. Enter the water as near to the edge as possible.

For a surface dive, use the breast stroke along the surface of the water. When you are ready to go under water lift your head high and take a really good breath.

The racing dive is performed as

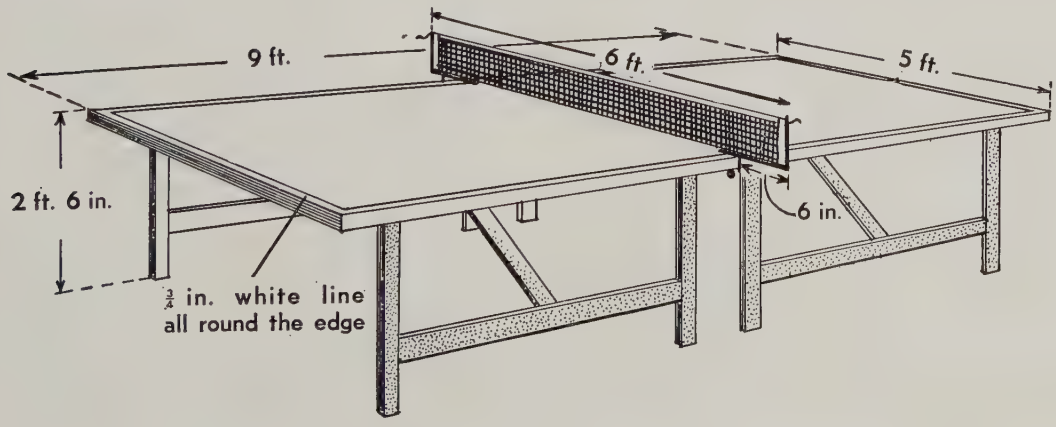
follows. The starter will call your name and give you your position. He will next say, "Take your marks !" At these words you should step up to the edge of the bath. Your feet should be slightly apart (about one foot length), toes gripping the edge of the bath, trunk forward, arms backward, and head up looking forward. You should be quite steady and on balance. On the word "Go" take a deep breath as you topple forward. As you reach the water you should straighten out your legs and body. You should swing your arms forward vigorously to help you to shoot your body forward into the water in a long shallow dive just under the surface of the water. Make sure you cover your ears with your arms, that you keep your hands together, and your legs together with ankles stretched until you break the surface several feet away from the bath edge. Only start swimming when the rate of your dive slows down to the rate at which you can swim. Most swimmers start moving their arms much too soon, wasting valuable time and energy.

(21)

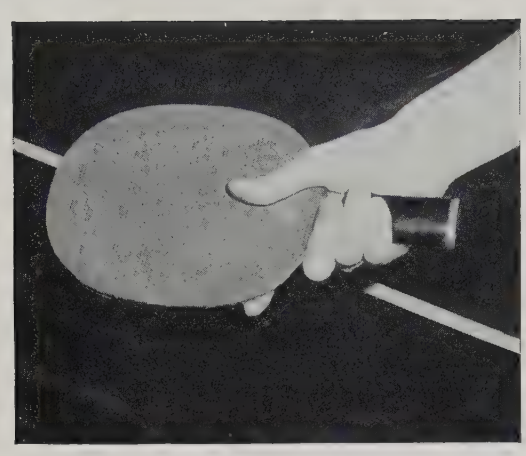
TABLE TENNIS

THE game is played between two players (singles) or four players (doubles). They stand on opposite sides of the net and hit the small celluloid ball to each other in such a way that it bounces on each side of the table alternately. The ball must be allowed to bounce and it must bounce once only before being hit. The ball must pass directly over the net (or round it). The player who scores 21 points first is the winner. If however both score 20 points then the game must be continued until one player wins 2 points more than his opponent.

When played properly the game requires a large playing area of about 25 ft. × 15 ft. The lighting must also



Here you see a full-sized table-tennis table as used in tournaments.



How to grip the bat.

be correctly placed, and of course it should be really bright.

The table is normally painted green with white lines as shown. The surface should be 2 ft. 6 in. from the floor.

It is, of course, possible to play a form of table tennis on your dining room table in your own home but usually the table is too small, the space not sufficient, and, what is even more difficult, the ball bounces far too high.

The rules state that the bat can be of any size, shape or weight. The best are made of plywood and are covered with pimpled rubber. They usually weigh about 5 ounces.

The ball is made of celluloid and is very light. Always buy a good standard make.

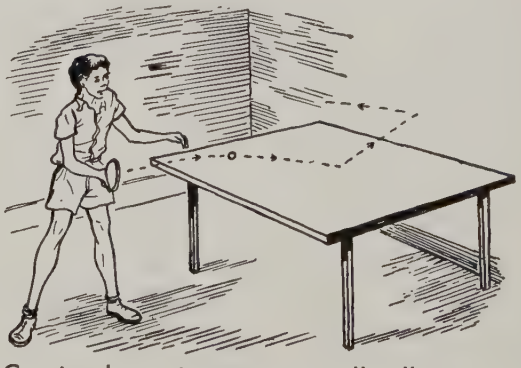
Grip the bat as if you were shaking hands with it. Use the same hold for both forehand and backhand strokes.

Here is a very good way of learning to hit a table tennis ball properly. Push a table against a wall as shown in the drawing. Now stand more or less sideways to the table edge and hit the ball down on to the table so that it bounces off, hits the wall and rebounces back to you. Let it bounce and hit it back again to hit the wall without first hitting the table. Keep count of the number of times you can do this without fault. Watch the ball carefully all the time. This is very important indeed.

You can also practise this with a friend working as a partner, in which case you play the ball back so that he can hit it easily. You can also play as "opponents" in which you make it difficult for him to return the ball. Keep your scores.

Many children merely hold the ball between the finger and thumb of the left hand, drop it and hit it across the net. This common method of serving would not be allowed in competition or match play. The ball must be first held in the palm of the hand and from that position thrown up into the air. Finger spin of any sort is not allowed.

The service must also be made from behind the edge of the table and from a position between the side edges of the table continued. The ball must bounce on the table on the server's side before crossing the net.



Continual practice against a wall will improve your play.

The end of the forehand drive.

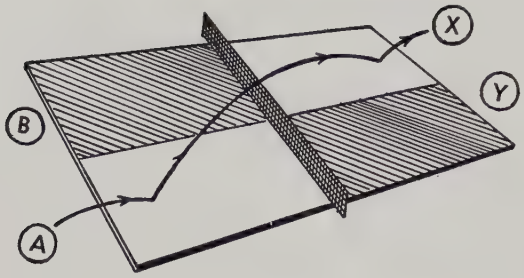
The push shot, or half volley as it is called sometimes, is the main defensive stroke. You do it by pushing your bat forward to meet the ball so that you hit it with a more or less upright bat, but just after it touches the table you can alter the angle of the returned ball by altering the position of your bat as it hits the ball. Tilt the bat back and the ball will rise on its return. Tilt the bat forward and you will keep the ball down on its return.

The forehand drive is the chief attacking stroke in the game. To play it you must stand sideways to the table, feet apart and weight on your back foot. You must hit the ball on the falling part of its bounce. Your arm must swing forward and upward vigorously, and as it does you must move the weight of your body forward on to your front foot. You must also tilt your bat forward so that you make the ball spin forward like the forward spin of a hoop when you bowl it along the ground. Notice the follow-through of the arm.

The backhand drive is another attacking stroke and it is performed in a similar way to the forehand drive. Note that the right shoulder is in front and that the right foot is nearer to the table than the left. Transfer your body weight forward as you hit the ball and do not forget the full flick of your wrist as you complete the stroke.

For the doubles game the centre line marks the table into four half courts. A and B play X and Y. All serves must be from the right-hand half of the court. After serving for five points the player must move away

The start of the backhand drive.



Plan for the doubles game.

from the right hand court to let his partner receive 5 serves and then make 5 serves. The game works out like this.

A serves to X for 5 points.
X ,, ,, B for 5 points.
B ,, ,, Y for 5 points.
Y ,, ,, A for 5 points.
A ,, ,, X again.

If the score is 20-20 each player must serve one service and then receive one instead of 5 serves as above. As in singles the first side to gain a lead of 2 points wins.

(22)

TOBOGGANING

WHEN reading about winter sports you may have seen a sportsman coming down the famous Cresta Run at St. Moritz in Switzerland. The slope, which has several turns and is about three-quarters of a mile long, has been specially made with ice banks. Very strong all-steel sledges are used, and the sportsman wears a crash helmet and special spikes on his boots to help him to steer and brake easily. Speeds up to 85 miles per hour are possible.

This sport of sliding down snow covered hills on a toboggan or sledge is known amongst children as sledging. Many use home made wooden sledges with steel runners, but for speed and for use in deep soft snow the specially constructed sledge of strips of wood forming a framework for the runners is best.

Steering with the toe when turning to the right and lying face downwards.

Turning to the right when sitting on a sledge.

Whether you are sitting facing the way you are going or lying face downwards, always remember that to go to the left you must press your left foot on to the snow. The harder you press the more the sledge will move to the left. In the same way you press down with your right foot to make the sledge go to the right.

A SELECTION OF WATER SPORTS FOR THE SUMMER HOLIDAYS

THERE ARE OTHER SOURCES OF INFORMATION BESIDES BOOKS

Index and Reference Encyclopaedia

THIS part of the book serves a double purpose. For one thing, it is an index to all the various topics that occur throughout the six books in this Library of Knowledge. But you will also find that each entry is followed by a few lines giving you the main facts about the topic—hence it also serves as a quick reference encyclopaedia complete in itself. All the entries are in alphabetical order, and there are numbers following each entry. That in thick type is the number of the book and those in thin type are the numbers of the pages where you will find the entry mentioned. A number in sloping type means that on that page you will find a coloured picture. Thus, **1** : 55–58, *59* means that the topic is mentioned in Book 1, on pages 55 to 58, and that on page 59 is a coloured picture of what is described in that particular entry. Sometimes in the course of an entry you will come across a word printed in SMALL CAPITALS. This means that there is another entry under the word printed in that way and by reading this further entry you will understand more about the topic, perhaps by finding the explanation of a special term that has been used. For example, in the entry on the **violin** you read . . . it is massed in the ORCHESTRA. . . . If you look up the entry **orchestra,** you will learn how the violin fits into the orchestra.

A

aardvark, an insect-eating mammal of Africa. It lives in a burrow during the day and comes out at night to feed on termites, which it digs out of the earth. **1** : 52

ABC, the first three letters of the alphabet, which consists of 26 letters with which we can form English words in writing. **6** : 9, *11–14*

abdomen, in animals, the part of the body which contains the stomach and intestines. In insects it is the hind part. **1** : 189, 200–201, 366

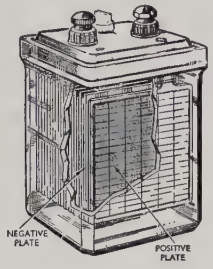
aborigines, the earliest inhabitants of any country. The word is usually applied to the primitive blackfellows of Australia. The men decorate themselves with paint and grease over the face and body. **2** : 177

acacia, a small tree or flowering SHRUB, also called mimosa. It has fern-like leaves and thorny stems. Its clusters of small flowers are usually yellowish. **1** : 218

accordion, a musical instrument consisting of a bellows which is expanded and then compressed by hand to supply a rush of air through metal reeds. To sound the notes there is a small keyboard at one side of the bellows and this is played with the right hand. The other hand presses studs which sound chords. **5** : 259

accumulator, a BATTERY for storing ELECTRICITY, such as is used for motor-card lighting.

The one shown is a single cell battery giving 2 volts. Three of



these joined in series would make up a 6-volt car battery.
4 : 146

acorn, see OAK.

Act of Union, see ANNE.

Adam brothers, four 18th-century house-designers, of whom the best known is Robert Adam, architect and designer of furniture, who lived from 1728 to 1792. Their furniture, fireplaces and architecture were influenced by their study of Roman architecture. **3** : 239

Adam's apple, a lump of GRISTLE which sticks out in front of the throat. **1** : 371

adjectives, words that tell you more about a NOUN: *green* grass, *many* people, *this* boy.
6 : 151

Adler, Larry, a famous mouth-organ or HARMONICA player who has attained during his own lifetime an international reputation in the field of classical music on his instrument. **5** : 260

Adriatic Sea, an arm of the MEDITERRANEAN between Italy and the Balkan Peninsula.
2 : *152–153*

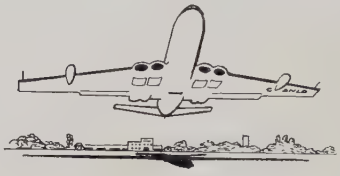
adverbs, words that tell you more about a VERB: Peter walked *slowly*. Daisy curtsied *low*. David thought *hard*. **6** : 152–153

Some adverbs tell you more about an ADJECTIVE: she is *very* pretty.

aerial, that part of a transmitting instrument which gives off the electrical vibrations into which sounds and scenes have been turned when they are broadcast. It is also the part of the receiving set that picks up the vibrations which the set will turn back into sounds, or into pictures. **4** : 180–181

aeroplane, a machine that flies, carrying people or goods.
4 : 230–247, *241*

Unlike the AIRSHIP and BALLOON, it is heavier than air and needs a runway (**4** : 237) to get off the ground. One type of aeroplane engine turns a propeller which by revolving rapidly pulls the craft forward, while the shape of its wings rushing against the air causes it



to rise (**4** : 237). The JET ENGINE, however, works on the rocket principle (**4** : 117, *122–123*).

The aeroplane is one of the great inventions of modern times, the first engine-driven flight taking place in 1903. (See FLIGHT PIONEERS.) Some early machines are shown in **4** : *231*, and, in contrast, others that fly faster than sound are shown in **4** : 246, with some that fly at more than 1,000 miles an hour.

The modern airport (**4** : *242–244*) with its runways and services and a flight in a passenger airliner (**4** : *232*) are described in **4** : 233–239. See also SEAPLANE, FLYING-BOAT, HELICOPTER.

Models of aircraft can be made from kits of parts (**5** : *330*, 334–338), they range from simple gliders to power models, which may be driven either by rubber bands or by small petrol engines.

Aesop, a slave at the court of Croesus, King of Lydia in Asia Minor. He became famous for his fables—little stories about animals having a sharp lesson for mankind. He lived about 570 B.C. **5** : 30–31

Afghanistan, a mountainous country in ASIA, north of Pakistan to which it is connected by the Khyber Pass. The chief towns are Kabul, the capital, and Kandahar. **2** : *158–159*

Africa, an equatorial CONTINENT between the Atlantic and Indian Oceans, its greatest area being north of the Equator. Sometimes called the "Dark Continent" because of its dense tropical jungles in the central regions, it has extensive DESERTS, the SAHARA and SUDAN in the north, and the KALAHARI in the south. The chief rivers are the NILE, CONGO, ZAMBESI and Niger. The population is predominantly Negro, with Arabs in the north. Many Europeans have settled in the Union of SOUTH AFRICA and in some coastal areas. **2** : *154–155*

Agincourt, town in France, near which occurred a great

battle in 1415, the English, under the inspiring leadership of Henry V, gaining a victory over the French. **3** : 140-142

agouti, a rat-like animal, about the size of a rabbit. It lives in Central and South America and is very fond of sugar-cane. Its white flesh is nice to eat. **1** : *41*

air, mainly a mixture of two gases, oxygen and nitrogen.
2 : 12 ; **4** : 48, 358–368

Air, like water, is necessary to all living things. It forms a sort of invisible layer, many miles thick, around the whole earth, and the weight of this upon us, which we call AIR PRESSURE (**2** : 12–14, 112 ; **4** : 58), is about 15 pounds at sea level for every square inch of the body. We do not notice this pressure because we have never known its absence. Experiment (**2** : 112) will show you that air presses upwards as well as downwards—in all directions in fact.

Warm air, like warm water, is lighter than cold and rises. Warm air dries up moisture, carrying it away as invisible vapour. When it meets the air in a colder region it can no longer

carry the vapour which turns back to water and falls as RAIN. When a mass of warm air rises over cold the result can be a wind storm.

Air can be pumped under pressure into strong containers, when it is called compressed air (**4** : 365). When oxygen alone is compressed in this way it can be carried underwater by divers or given to invalids to ease their breathing (**4** : 366). Compressed air can also be used to work machinery (**4** : *133*, 368) such as train brakes and road drills.

aircraft-carrier, a warship carrying planes which can take off from and return to the deck. **4** : *111*, 206–207

air gun, a light type of gun which fires pellets or darts, by

the sudden release of compressed air. **4** : 366

air-mail, the carrying of letters by aeroplane. **4** : 171

airport, see AEROPLANE.

air pressure, the weight of air pressing upon anything. The BAROMETER is an instrument for measuring air pressure as a means of forecasting the weather. See also ATMOSPHERE and CLIMATE. **2** : 12–14, 112 ; **4** : 58

air pump, in its simplest form a bicycle pump. It is a means of compressing air. **4** : 366

airship, a sausage-shaped BALLOON filled with a light gas and driven by engines. In the First World War the Germans used airships called Zeppelins and some very large airships were made between about 1910 and 1930 but were replaced by aeroplanes. **4** : *231*, 233

aisle, the space between the side walls of a church and its rows of columns supporting the roof. **5** : 198

The word is also used for the passage-way down the centre of the church.

Alaska, one of the United States ; it lies to the north-west of Canada, bought by the United States from Russia in 1867. It is very cold except in the south. Gold is mined and salmon are caught and canned. The capital is Juneau. **1** : 22 ; **2** : 64, *163*

Albania, a mountainous country (part of the BALKAN PENINSULA) on the eastern shores of the Adriatic Sea. Much of the country is used for sheep- and cattle-rearing, though some regions yield copper and oil. The capital is Tiranë, which has a population of over 30,000. **2** : *152–153*

alchemist, the medieval forerunner of the scientist. Alchemists, of whom the English monk Roger Bacon (lived from 1214 to 1294) was one, spent much time trying to change common metals into gold, but in so trying they learned facts of value in the later development of chemistry. **4** : *20*, 21

Alcott, Louisa May, American writer who is best known

for *Little Women* and *Good Wives*, stories of four sisters during the American Civil War. **5** : 71

alder, a tree or SHRUB related to the birch. Alders are often found as thickets in moist ground. Their bark is used in tanning and dyeing. **1** : 235

alevin, see SALMON.

Alexander the Great, see ANCIENT WORLD.

Alexandria, the chief seaport of Egypt. It was founded by Alexander the Great and was at one time the greatest city of the known world. The modern city is situated at the north-west corner of the NILE delta. It has a population of over one million. **2** : 33, *37*, *154*

Alfred, King of Wessex, fought the invading DANES for many years, defeated them in

878, and then exacted homage. He was the first in England to build a navy and establish a code of law. He encouraged writers and started a history of England. He lived from about 849 to about 890, and is now known as Alfred the Great. **3** : *2*, 52–56, *57* ; **5** : 17

algae, flowerless green plants. Seaweed is one form of algae, so are pond scums. **1** : 224

Algiers, a Mediterranean seaport and the capital of Algeria, in North AFRICA. **2** : *224*, 225

"Alice's Adventures in Wonderland," see CARROLL.

alimentary canal, the name given to the digestive tube, along which food passes from the mouth and through the body. Digestive juices enter the tube at various points. See DIGESTION, FOOD. **1** : 361–364

alligator, see CROCODILE.

allosaurus, one of the giant flesh-eating DINOSAURS that lived

at the same time as the BRONTOSAURUS and STEGOSAURUS, during the great Age of REPTILES. The

allosaurus walked on its hind legs and used its forelegs for holding things. **1** : 280

alpaca, an animal found in the Andes in South America. It is raised for its wool, which is long and straight. **1** : 315

alphabet, see ABC.

Alps, a mountain system extending from south-east France to southern Austria and covering much of Switzerland, and including Mont Blanc, the highest peak. **2** : 218–219

Amazon, a river of SOUTH AMERICA which flows 4,000 miles from the ANDES across BRAZIL to the sea. **2** : *164*

ammonite, see FOSSIL.

amoeba, one of the smallest and simplest of all animals. Under the microscope it looks like a speck of jelly, containing a thicker core, or NUCLEUS. After reaching a certain size the amoeba splits, and becomes two creatures. **1** : 224–225

amphibians, a group of animals with backbones, which begin life in the water, breathing by means of gills, and later change into adults that live on land, breathing by means of lungs. FROGS, TOADS, NEWTS and SALAMANDERS go through this METAMORPHOSIS, but some salamanders continue to breathe through gills. Their skin is smooth and clammy, never scaly like that of reptiles. **1** : 15, 142–152, *145–148*, 276–278

Amsterdam, the capital of HOLLAND and centre of the diamond-cutting industry, famous for its canals and ship-building. The population is 900,000. **2** : 209, 352

Amundsen, Roald, Norwegian explorer who was the first man to reach the South Pole, and to navigate the North-West Passage. He lived from 1872 to 1928. **3** : *170*, 339–340

anaconda, a huge South American SNAKE which kills its victims by crushing them. See also PYTHON. **1** : 128–129

anaesthetics, drugs which deaden pain or send you to sleep, so enabling surgeons to operate on patients without their feeling pain. **3** : 380

anatomy, the study of the structure of the body. **5** : 129

Ancient World, the period which saw the rise and fall of great empires around the Mediterranean. It began when history started to be written down and ended with the fall of Rome in the fifth century. **6** : *318*, *336*, *390*

The first empire was that of Egypt, which flourished along the banks of the river Nile a thousand years or more before Christ (**6** : *318*). To the east in the land around the Tigris and Euphrates, now known as Mesopotamia, grew up the empire of Babylon, but this fell to the Assyrians who came down from the north, and whose conquests included Egypt. But the Babylonians, helped by their allies the Medes, rose against the Assyrians, and once again made Babylon into a great city. Their king Nebuchadnezzar captured Jerusalem and carried off the Jews into captivity. But the Persians rose to power and under Cyrus the Great, who had already subdued the Medes, captured Babylon, releasing the Jews. Later the Persians were overthrown by Alexander the Great, who having united the GREEKS (**6** : *336*) set out to conquer the known world. He had conquered Egypt and went on as far as India before turning back. He died in Babylon and after his death one of his generals, Ptolemy, became ruler of Egypt. This family ruled Egypt until the time of Cleopatra.

This famous queen was friendly with Julius Caesar, emperor of Rome (**3** : 17–18 ; **6** : *390*), the new power that had arisen and overrun the Greek empire. But Caesar died, Egypt was invaded by Roman armies, and Cleopatra killed herself. In its rise to power Rome had had to struggle against the great North African city of Carthage, whose general Hannibal had invaded Italy from the north and almost captured Rome in 218 B.C. But eventually Carthage was destroyed. Constantine, the first Christian emperor, built a new capital, Constantinople, which became the capital of the eastern empire when the Roman empire split in two. Rome, capital of the western empire, was overrun by barbarians in the fifth century A.D., but the eastern empire continued for a thousand years more.

Andersen, Hans Christian, a Danish author, became world-famous for his FAIRY-TALES for children. He lived from 1805 to 1875. **5** : 26–27

Andes, a mountain range extending along the Pacific coast of SOUTH AMERICA. **2** : *164*

Andrew, St., a fisherman who became a disciple of Jesus and after his death the patron saint of Scotland. **3** : 26–27

angler fish, a monstrous-looking deep-sea fish with a structure like a small rod, line and bait rising from its back fin so that what looks like a piece of food dangles and shines in front of its face, whereby smaller fishes are lured close to the angler's huge mouth and swallowed. **1** : 170, *175*

Anglo-Saxons, people of Germanic origin—Angles, Saxons, Jutes—who raided the island of Britain across the North Sea. At first Britain was protected by the ROMANS occupying the island, under their military leader, the Count of the Saxon Shore, but when the Romans left to defend Rome in the 5th century, the Anglo-Saxons poured in and settled. During the 7th century they were introduced to Christianity by St. Augustine and his followers. By the end of that century they had forced the Ancient Britons into Wales, Cornwall and Cumberland and

had established kingdoms in most parts of England. Though destined to be conquered by the NORMANS some three or four centuries later, Anglo-Saxon civilization was well-established in England, leaving its mark even now on English laws and customs and giving us a large part of the words of modern English. **3** : 31–34, 40–43, *46–47* ; **5** : 14–57

animals, any form of life other than plants. All living things are either animals or plants. The chief differences between them are that green plants can make their own food, and do not move about from place to place, while animals feed on plants or other animals, and have to move about to find their food. The animal world is divided into two main groups, VERTEBRATES, or animals with backbones, and INVERTEBRATES, or animals without backbones.

1 : 11–226, 272–383

Anne, the second daughter of James II, was queen from 1702 to 1714, during which time England and Scotland were united by the Act of Union, 1707, and France was defeated in great battles in the Netherlands by British troops under John Churchill, Duke of Marlborough. She lived from 1665 to 1714. **3** : 223, 224, 343

Anno Domini, "in the year of our Lord," that is the year of His birth from which our measurement of the centuries is reckoned. Events before Christ are dated B.C. and those after His birth are dated A.D. **3** : 26

annual, a plant which germinates, bears flowers and produces seed all within one year, and then dies. See also BIENNIAL and PERENNIAL. **1** : 247

answers, to the questions set in the School Companion volume, provided so that you can check whether you have worked them out right. There are questions on Arithmetic, English, and general questions to test your intelligence.

6 : 141–143, 160–162, 185–189

ant, an insect which is closely related to the bee and the wasp. Ants live in colonies, generally occupying nests built in the earth. The workers and soldiers are wingless females. Winged females are called queens, and these when fertilized by the males, lay eggs. The eggs eventually hatch out into grubs. Some ants capture and keep aphids (plant-lice) and "milk" them regularly of the HONEY-DEW in their bodies.

1 : 212–214, *215*, 217

White ants are not ants but TERMITES.

anteater, a mammal that lives mainly on ants. The spiny anteater of Australia is also known as the echidna and is one of the mammals that lay eggs.

1 : 52, 67–70

The true anteaters belong to a different group of animals.

They live mainly in Central and South America. They have no teeth, hence their liking for the soft-bodied ants among their diet.

antelope, a hoofed MAMMAL that closely resembles the DEER. Antelopes are found chiefly in Africa, but some live in Asia. Unlike the deer, they have hollow horns, instead of antlers, which they do not shed. Another difference is that in some kinds of antelope both males and females have horns. Gazelles are small antelopes.

1 : 35

anther, the part of a plant inside which POLLEN grains are produced. See also STAMEN and FLOWER. **1** : 231, *233*

anthracite, one of the best types of COAL. **2** : 275

anti-cyclone, a weather phenomenon which brings fine weather. **2** : 123

ape, man's nearest relation in the animal kingdom, having a large brain, no tail, and frequently walking or standing on its hind limbs. **1** : 72–76, *77*

There are only four kinds of ape. The gorilla (**1** : 74–75, *77*) and the chimpanzee (**1** : 72–74, 290–291) live in Africa, the gibbon (**1** : 75, *77*) lives in south-east Asia, and the orang-utan (**1** : 74–75) is found only in Borneo and Sumatra. The so-called "Barbary ape" belongs to the group of macaque MONKEYS.

aphids, insects with strong, needle-like jaws that enable them to pierce the stems of plants, and to suck the juice. Known also as plant-lice, or greenfly, they are INSECT PESTS familiar to the gardener. They have many enemies in the insect world, for the LARVA of the ladybird, of lacewing flies and of hover-flies all feed on aphids. But the ANT finds them very useful, for HONEY-DEW oozes from their bodies, and the ant "milks" them of it.

1 : 201, 214, *215*

Apollo, see MYTHS AND LEGENDS.

Apostles, the 12 men whom JESUS picked out for the special work of carrying His message through the world. **6** : 196

Among them were Simon Peter (**6** : 196–197, 199, 201), James and John (**6** : 197, 201), Philip (**6** : 204), Thomas (**6** : 202), and Judas Iscariot (**6** : 198) who was destined to betray Jesus.

apple, a refreshing fruit with firm white flesh surrounding the SEED case or core. There are many different varieties of apple.

1 : 199, 357 ; **6** : 60

appliqué work, one of the many ways of making pictures. It consists of building pictures out of pieces of coloured cloth, or other materials, which have been cut to shape with a pair of scissors and sewn upon a plain background of contrasting material. **5** : 354–355, *358–359*

aquarium, a glass-fronted tank in which live fish are kept and displayed. Children can easily learn to equip and stock their own aquarium. **1** : 174–175, *176*, 177–178, 239 ; **4** : 66

aqueduct, a pipe carrying water. Some of these were constructed by the Romans across wide valleys, thus bringing a water supply to towns far from rivers and lakes. **5** : 208 ; **6** : *390*

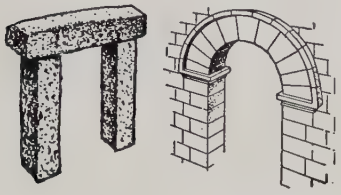
Arabia, a large peninsula in south-west ASIA between the Red Sea and the Persian Gulf, comprises SAUDI ARABIA, Yemen,

Aden Protectorate, Oman and Trucial Oman. **2** : *158–159*

The dark-skinned people of Arabia and neighbouring countries are called Arabs (**1** : 315).

"Arabian Nights' Entertainments," a wonderful collection of eastern fairy tales of princes and genii, translated from the Arabic, *Ali Baba*, *Aladdin* and *Sindbad the Sailor* being among those children love best. **5** : 29–30

arch, the curved upper part of a doorway, window, etc. The shape of these developed from



the straight side posts and lintels of the Greeks to the rounded form of the Romans and Normans, which in its turn became pointed in the Gothic period. **5** : 199, 206–207 ; **3** : 109

archaeology, the study of the distant past, which is usually pursued by digging on the site of ancient ruins and tombs for fragments of the tools, weapons, dishes and coins of a bygone civilization. **6** : *317*

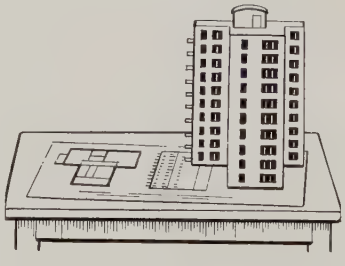
archaeopteryx, the earliest bird known. It had a long tapering tail, with feathers along each side, and jaws armed with teeth. **1** : 279–280, *282*

archer fish, an extraordinary fish that can shoot down an insect in flight by spitting a drop of water at it. **1** : 173, *175*

Archimedes, a native of Sicily of the 3rd century B.C. He is famous as the mathematician and engineer who discovered that a liquid exerts an upward pressure on objects immersed in it equal to the weight of the liquid displaced. **4** : 59–60

architecture, the science of designing buildings suitable for their purpose, and at the same time the art of making them beautiful to look at. **5** : 181–220 ; **4** : 315

The first architects proper were probably the Ancient EGYPTIANS (**6** : *318*) whose rulers constructed huge temples and tombs. These were followed by the Ancient GREEKS (**6** : *336*) with their fine temples and theatres, and then the ROMANS who continued to build in the Greek style. After the collapse of the Roman Empire there was little building in Europe for 500 years, but in the Byzantine Empire round Constantinople a new form of building developed in which architects discovered how to construct a dome. Meanwhile in England many churches were built by the NORMANS in a stark, simple style with massive pillars and rounded arches (**3** : 72–74 ; **5** : 199). In the 13th century the style known as Gothic grew up. This had pointed arches, vaulted roofs and outside BUTTRESSES. As the amount of carving and statuary increased this developed into the Decorated Gothic style (**5** : *94*, 199 ; **3** : 109). At the time of the Renaissance the Roman style was revived, but with the addition of a dome, as in St. Paul's Cathedral in London or the Capitol in Washington. During the 19th century there was a great revival of Gothic architecture. In modern times, new materials such as CONCRETE and STEEL have enabled architects to produce quite new designs in their



BUILDINGS. Architects make great use of plans and models when designing a new building.

Arctic Circle, the line of LATITUDE, north of which the sun never sets for part of the summer and never rises for part of the winter. See MIDNIGHT SUN. **2** : 54

Arctic Ocean, an area of water within the Arctic Circle. **2** : 64, *152–153*

area, a definite amount of surface such as that contained in a square, triangle, circle or many-sided figure. This page, a street, or a garden, each occupies an area, and knowing how to measure areas—part of ARITHMETIC—is necessary before you can buy a carpet, sow a field, or paper a room. In regard to areas we must think a great deal about length and breadth. When we add a third measurement—height—we are dealing with VOLUME. See also MENSURATION. **6** : 132–135

Argentina, or the Argentine, a country in SOUTH AMERICA famous for its cattle and sheep-rearing. It sends frozen meat all over the world. The chief port and capital is Buenos Aires. **2** : 196–197

The gaucho (**1** : 309) is the cowboy of the Argentine and other South American countries.

Aristotle, see GREEKS.

arithmetic, the science of counting or numbering, A practice course in ten lessons is given, with questions and answers. **4** : 12 ; **6** : 107–108, 113–143

The special topics are dealt with on the following pages—addition (**6** : 115), subtraction (**6** : 116–117), multiplication (**6** : 117–121), division (**6** : 121–125).

Arkwright, Sir Richard, see INDUSTRIAL REVOLUTION.

arm, one of the two upper limbs of a person, generally describing the part between the shoulder and the wrist. **1** : 375

Armada, the great fleet built by the Roman Catholic King of Spain with which to invade Queen Elizabeth's England in 1588. **3** : *182*, 186–189

armadillo, an insect-eating mammal of South America

belonging to the same group as the anteater and the sloth. It

feeds also on roots and fruits and other small mammals. The armadillo is different from other mammals in having a protective armour of horny plates joined by flexible skin. **1** : 52

Arne, Dr. Thomas Augustine, an English musician and composer who lived from 1710 to 1778. He is chiefly remembered for his song *Rule, Britannia.* **5** : 249

Arnold, Matthew, son of a famous headmaster of Rugby School, and himself a school inspector, poet and critic of literature. He lived from 1822 to 1888. **5** : 102

art, any form of creative work that gives pleasure to the beholder. The arts include MUSIC, POETRY, DRAMA, BALLET as well as the visual arts like PAINTING, DRAWING, SCULPTURE, ARCHITECTURE—often known as the fine arts. **5** : 9–285

artery, a BLOOD-VESSEL in which the flow of blood is away from the HEART. The walls of an artery are thick and muscular. See also VEIN. **1** : 369–371

Arthur, a legendary king of ancient Britain whose Knights of the Round Table are the subject of many tales of chivalric adventure. We do not know how they were invented, but a 15th-century writer, Sir Thomas Malory, collected them and re-told the stories in his book *Morte d'Arthur.* In the Elizabethan Age the stories were again re-told by Edmund Spenser in an epic poem, *The Faerie Queene,* and in the Victorian Age by Tennyson in his *Idylls Of The King.* See also MYTHS AND LEGENDS. **5** : 33–36, *37,* 39

ash, a well-known timber tree of the olive family, with white hard wood. **1** : 237, 257

It also refers to the substance that is left after something has been burned. It is more often used in the plural—ashes (**1** : 368).

Asia, the largest CONTINENT, has a total area of more than 17 million square miles and extends northwards from the Indian Ocean to the Arctic Ocean. Its eastern shores are bounded by the Pacific Ocean and westwards its main boundaries are the Ural Mountains and the Red Sea. Its largest countries are CHINA, RUSSIA, PERSIA, INDIA and SAUDI ARABIA. The central regions consist of a vast plateau varying in height from 3,000 to 15,000 ft. on the southern boundaries of which are the HIMALAYAS. It has a population of more than 1,000 million people. **2** : *158–159*

assizes, a special kind of court devised in the 12th century by Henry II as part of his struggle for power with the barons. It was a system of trial by judges appointed by the King, and one could choose to be tried in this way rather than by the local court. Nowadays the assizes are still held in important towns. The Queen's Judges of Assize try important cases. **3** : 286, 375

Association football, the leading British winter game. Two teams of 11 players each play on a rectangular field with goal-posts at each end. The object is to kick an inflated leather ball through the opposing goal. Only the goalkeeper is allowed to handle the ball whilst it is in the field of play, and he can only do so inside a restricted area. **6** : 213–220

Assyrians, see ANCIENT WORLD.

astrology, see STARS.

astronomy, see STARS.

Athens, the centre of culture of Ancient Greek civilization and capital of modern GREECE. The population is 1,800,000. **2** : 221

athletics includes the sports in which we compete with others. **6** : 221–222, *253, 254*

Such are running (**6** : 221–222), the high jump (**6** : 223), the long jump (**6** : 224–225), throwing the cricket-ball and hurdling (**6** : 226), tossing the caber, etc. (**6** : *254*).

Atlantic Ocean, an area of water north and south of the Equator between Europe and Africa in the east and North and South America in the west. **2** : 116–121, *156–157*

atlas, a book of maps relating to all the countries of the world. **2** : *147–165*

Atlas, the Greek god who held up the sky. **5** : 8–10

atmosphere, the layers of AIR surrounding the EARTH. See also CLIMATE and WEATHER. **2** : 13, 111–115

atoll, see CORAL.

atom bomb, a very powerful type of bomb first used in 1945, against Japan in World War II. **3** : 358

atomic power, can be released like an explosion, or slowly. The first way gives the atom bomb; the second way gives off heat like that which you get in a furnace. Indeed, an atomic power station, or pile, is a sort of furnace in which the metal uranium is giving off energy, that is, creating heat. This heat can be used to drive an electricity GENERATOR, the current so made being taken by cables to wherever industry requires it. **4** : 162; **6** : *372*

Augustine, St., see ANGLO-SAXONS.

Australia, an island continent and British dominion between the Indian and southern Pacific Oceans. It has seven states, New South Wales, Victoria, Tasmania, South Australia, Western Australia, Northern Territory and Queensland. The capital is CANBERRA and the chief

cities are SYDNEY (with its well-known bridge), Melbourne, Brisbane, Hobart, Adelaide and Perth. Although Australia is so large, the total population is only about 8½ million. **2** : *160–161*

Great sheep farms exist there (**1** : 313–314; **2** : 318–324) and large quantities of wheat, fruits (**2** : 338–341) and dairy foods are grown. The chief minerals found there are GOLD (**2** : 263–264), iron ore and coal. The central and western regions are largely desert.

Australia was claimed for Britain by Captain COOK, who

landed at Botany Bay. In 1788 this region was used by the British government as a convict settlement. Further settlers followed, and with the discovery of gold and the growth of the wool trade, a new nation grew up there as a member of the BRITISH COMMONWEALTH. (3 : 256–257, 305, 308–309, 362–366).

Austria, a country of central EUROPE, consisting largely of the Austrian Alps. The chief occupation is agriculture ; the capital is VIENNA, on the DANUBE. 2 : *152–153*

Authorized Version of the Bible, see BIBLE.

Autogyro, an aeroplane with wings revolving overhead instead of fixed wings at the side. Such an aeroplane can descend vertically. It is not to be confused with the HELICOPTER. 4 : 245

avalanche, a vast fall of snow and rock down a mountainside. 2 : 76

Avebury, in Wiltshire, the site of the largest stone circle in Britain. 3 : 12

avens, or herb-bennet, a plant found on the borders of woods. It has a yellow flower like that of a buttercup, and long, toothed leaves. 1 . 237

Avercamp, Hendrik, Dutch painter who lived from 1585 to 1663. He was famous for his realistically painted Dutch winter scenes. 5 : *137*

axolotl, a Mexican type of SALAMANDER. 1 : *148*, 152

Ayrshire cattle, a breed of dairy cattle from Scotland. They are tough, medium-sized animals, usually with white and brown patches. 1 : 359

Aztecs, see MEXICO.

B

Babel, Tower of, see LANGUAGE.

baboon, a remarkably ugly type of MONKEY with cheek pouches. One kind, the mandrill, has patches of bright red, and a blue nose. 1 : 74–76, *77*

Babylonians, see ANCIENT WORLD.

Bach, Johann Sebastian, was born of a musical German family and became a teacher and composer of music. He is held to be one of the world's very greatest composers, having written over 300 cantatas (musical settings with songs and choruses for dramatic poems) and many compositions for the organ, and clavichord (see PIANO) as well as for the ORCHESTRA. He lived from 1685 to 1750. 5 : 233, *248*, 253, 257

backbone, the spine, or the column of bones, in the back of an animal or human being. 1 : 374, 376

Bacon, Francis, see JAMES I.

Bacon, Roger, see ALCHEMIST.

bacteria, a large group of tiny living cells which can only be seen through a MICROSCOPE. See also GERM. 1 : 356

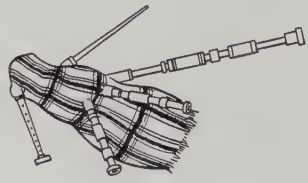
Baden-Powell, Robert, British soldier who founded the

Boy SCOUTS and GIRL GUIDES, devoting his last 30 years to the movement. He became a lord. He lived from 1857 to 1941. 3 : 348

badger, a heavily-built, bear-like animal found in Britain and seldom seen because it lies in its "earth" during the day—a circular chamber at the end of a deep burrow. It hunts rabbits, beetles and grubs by night. 1 : 49–50, 296

Baffin, William, an explorer and sailor, who tried to discover the NORTH WEST PASSAGE. Although he failed to find a way through the ice he made important discoveries on the west coast of Greenland. Baffin Bay was named after him. He lived from 1584 to 1622. 3 : *170*, 175

bagpipe, an ancient musical instrument, now largely confined to Scotland and Ireland, the Balkans and the Himalayas.



It consists of a wind bag, usually filled by blowing down a pipe, and a reed pipe, or chanter, with a number of holes in it by means of which the tune is played. There are often extra pipes, known as drones, which can play only one note each. 5 : 264, *285*

Baird, John Logie, the Scottish engineer who first managed to send pictures through space. (See TELEVISION.) He lived from 1888 to 1946. 4 : 357

Bakewell, Robert, a famous English farmer of the 18th century whose experiments in the breeding of sheep, cattle and horses established new standards for these animals. 1 : 359

Balkan Peninsula, a region in south-east EUROPE comprising YUGOSLAVIA, BULGARIA, ALBANIA, GREECE, and TURKEY in Europe. 2 : *152*

Ball, John, a fiery priest of the 14th century to whom are ascribed the lines:

When Adam delved and Eve span,
Who was then the gentleman?

3 : 138

ballad, a simple tale in verse of unknown authorship handed down by word of mouth and recited by minstrels in the Middle Ages when books were scarce. The subject is often based on some actual happening, long to be remembered, such as a border battle which cost many lives, or a famous love that ended in tragedy. 5 : 22–25

Ballantyne, Robert Michael, a 19th-century writer of boys' adventure stories, many of which, like *Coral Island* and *The Dog Crusoe*, are still read. He lived from 1825 to 1894. 5 : 69

ballerina, a female BALLET dancer, but often used of the

leading woman dancer or prima ballerina. 5 : 270–271

Among the great ballet dancers of the past are La Camargo (5 : 266), Marie Taglioni (5 : 267), Anna Pavlova and Karsavina. Among the most famous of today are Margot Fonteyn in Britain (5 : 270–271, 280) and Ulanova in Russia.

ballet, a form of art in which a simple story is unfolded on the stage by means of dancing to music instead of by means of uttering words as in a play or by singing as in an opera. While it existed in the 16th century, it gained popularity in the 17th at the court of the French king, LOUIS XIV, whence it eventually reached Russia, Britain and other lands. The Russians, who love dancing, made ballet their own and for long Russian ballet has held first place in the world's esteem. Britain in this century, however, awakened by the ballet of Sergei DIAGHILEV, has developed its own ballet for which there is now great enthusiasm. 5 : 265–280, *273, 276*

Ballet terms (5 : 266–267) are mostly in French because it was in France that the ballet made great progress and from France that it reached other countries of Europe. *Corps de ballet* is the body of dancers who support the prima ballerina or leading woman dancer ; and there are many names for the accepted motions and postures such as *arabesque*—when one leg is stretched out behind and one arm in front and the other behind ; and *entrechat*—the opening and closing of legs several times when the dancer is leaping in the air ; and *pirouette*—a complete turn made by the dancer while balanced on the toes of one foot.

balloon, a large bag filled with a gas lighter than air and so made to sail aloft. When big enough it could lift two or three passengers in a wicker car attached to the balloon by ropes. The balloon was at the mercy of the wind, but the airship and aeroplane which succeeded it can go where they choose under engine power. 4 : 232–233

balsam, a plant which originally came from India. It has pink flowers, and its ripe pods pop open to scatter the seeds. 1 : 248

Baltic Sea, the almost landlocked sea in northern Europe, between Sweden and Finland. 2 : 49, *152–153*

bamboo pipe, a simple musical instrument which can be made quite easily at home. 5 : 378–379

banana, a most important food plant in tropical countries.

It has enormous leaves and the fruits hang down in great clusters. 1 : 250 ; 6 : 60

bandicoot, a pouched MAMMAL of Australia and Tasmania. It feeds on insects and grubs, and vegetable matter, which it digs out of the soil with its powerful claws. 1 : 64–66

Baptist, a member of the Baptist Church which requires that each of its members shall be baptised by the immersion of the whole body in water after he has given an account of his faith. 5 : 45

Barbary ape, see MONKEY.

barge, a long, low, narrow, cargo-carrying vessel for use on

CANALS and rivers and in coastal waters. 4 : 84, 96, 192–194, *209*

Barham, Richard Harris, English versifier who wrote the amusing *Ingoldsby Legends*. He lived from 1788 to 1845. 5 : 98

bark, the outer protective covering or skin of the trunk and branches of a tree. 1 : 253

bark rubbing, a process similar to the hobby of BRASS-RUBBING but one which takes impressions of the different kinds of tree trunks. 5 : 304–305

barley, a cereal which has been grown in many parts of the world from the earliest times. It is used in the making of malt for malted milk and beer. 1 : 329, 335–336, 348

barnacle, one of the animals belonging to the group known as CRUSTACEANS. Acorn barnacles are found on rocks. 1 : 156

barometer, an instrument for telling us whether it is likely to

be dry or wet. Two kinds are described—mercury and aneroid. 4 : 361–362; 2 : 121

barracouta, a fish found in the seas off Australia, known also as snoek. It is very tasty, and sold in tins, like salmon. 1 : 170

barracuda, a dangerous eight-foot-long tropical fish that can tear almost anything to pieces with its sharp teeth. 1 : 169

Barrie, Sir James Matthew, Scottish playwright famous to children as the creator of Peter Pan, the boy who never grew up. He lived from 1860 to 1937. 5 : 90, *175*

basilisk, a species of LIZARD with a crested neck. 1 : 134, *136*

bassoon, the big bass woodwind instrument of the OBOE family. It consists of a large tube bent back on itself to end in a curved metal mouthpiece containing the reed. 5 : 227

bathyscaphe, a submarine capable of diving miles down into the ocean. **4** : 208

bats, a group of flying MAMMALS whose front limbs are somewhat like skeleton hands, between the fingers of which skin is stretched to form wings. The bodies are small and furry. They fly by night pursuing insects, and by day hang downwards in caves and hollow trees. There are also fruit-eating bats in the tropics. **1** : 54

battery, electric, an apparatus for making ELECTRICITY by chemical means. Compare it with ACCUMULATOR. **4** : 145–146

battleship, a very big type of warship, not being built nowadays as it is too exposed to air attack. **4** : 206–207

Bax, Sir Arnold, an English composer, lived from 1883 to 1953. His works include eight symphonies, film music and the tone poem *Tintagel*. He was Master of the King's Musick from 1942 onwards. **5** : 36

Bayeux Tapestry, a sort of picture strip of enormous length sewn in coloured wool on linen, telling the story of the events that led up to the Norman Conquest of England. It was made in the 11th century, presumably by Matilda, William the Conqueror's wife, and gives the Norman view. **3** : 68–70

Baylis, Lilian, see SADLER'S WELLS.

B.B.C., the British Broadcasting Corporation, responsible for radio and some television services in Britain. **4** : 182

Beaker Folk, the people with a knowledge of pottery and metals who settled in Britain alongside the early farmers and built STONEHENGE. **3** : 15

bean, the seed of a pod-bearing plant. A number of different types of beans are grown in the garden and used for food, among them the broad bean, French bean, and scarlet runner. **1** : 328, 335–336, 338

bear, a large MAMMAL that belongs to the group of CARNIVORES or flesh-eaters, although it feeds also on the fruit and roots of plants. Bears are big, heavily-built animals, with broad, flat feet armed with strong claws. Unlike cats, they cannot draw in their claws. They are found in North America, Europe and Asia, but are absent from Africa, Australia and New Zealand. **1** : *20*, 21–22

The grizzly bear of the Rocky Mountains has the repu-

tation of being very fierce (**1** : 22). The polar bear lives among the snows of the Arctic and lives on SEALS and fish (**1** : *20*, 22 ; **2** : 59). The only bear found in South America is the spectacled bear, which lives in the Andes.

beaver, a North American RODENT that lives in colonies in

rivers, gnawing down trees with which to make a dam behind which it builds its home, known as a lodge. The beaver is also found in Europe. **1** : 24–25, 310

Bechuanaland, a large area of desert and poor grassland in South Africa. Its population is about 266,000. Millet and maize are the chief crops. **3** : 334

Becket, St. Thomas, Chancellor of England and Archbishop of Canterbury, he was slain at the suggestion of King HENRY II for upholding the Church against the wishes of the monarch. He lived from 1118 to 1170. **3** : 85–87

Bede, the Venerable, a Benedictine monk who translated St. John's Gospel into Old English and wrote a history of the Church, now a chief source of knowledge of his age. He lived from 673 to 735.

3 : *48* ; **5** : 16–17

bee, an insect closely related to the ant and the wasp. The honey or hive bee lives in a hive or box where it produces honey from a sweet liquid called nectar, which it gathers from the flowers. There are three kinds of bee in the hives ; the queen, or mother of them all, the only one who can lay eggs ; the male drones; and the workers. When the hive becomes too crowded the old queen will fly off to a new home with thousands of the workers. This flight is called a swarm. **1** : *216*, 217–220, 336, 350, 353–354

beech, a tree which has smooth grey bark, deep green leaves, and bears small sweet nuts, triangular in shape, called beechnuts. **1** : 235, 253

bee hawkmoth, a moth that looks so like a bee that other creatures are likely to leave it alone for fear of being stung. See also MIMIC. **1** : 195, *294*

Beethoven, Ludwig van, German musician. Even as a child he was a marvellous pianist, and conducted orchestras at the age of 12. He met Mozart, studied under Haydn and settled in Vienna. He was a

quarrelsome man but had great courage. Even after he suffered the disaster of going deaf, he went on composing some of the world's greatest music, which he would never hear played, but could "hear" with his imagination. His strength, courage and

greatness of character are in his music together with a supreme expression both of the graceful in sound and of the tragic in spirit. No music is more often heard in the concert halls of the world than his nine symphonies, his seven concertos, his many piano and other sonatas, his quartets and other chamber music. Many would say that he is the Shakespeare of the world of music. His love of freedom is shown in his only opera, *Fidelio*. He lived from 1770 to 1827.

5 : 233–234, 239–240, *248*, 257

beetle, an insect in which the front pair of wings is hard and stiff and not used for flying, but serves merely as covers for the second pair. Some beetles are helpful to man in that they eat harmful insects. In this class are the ladybird, which feeds on greenfly ; and the glow-worm, which is not a worm at all, but a beetle—it feeds on slugs and snails. Scarab beetles help to fertilize the ground. Tiger beetles are helpful because they prey on insects and reduce their numbers. Sexton beetles bury dead animals in order to lay their eggs in their bodies. Among the harmful beetles are cockchafers or may bugs, whose grubs destroy grass roots ; flea beetles, which attack cabbages ; click-beetles, whose grubs called WIRE-WORMS attack the roots of crops ; Colorado beetles which feed on the leaves of potato plants and soon destroy them. The great Goliath beetle of Africa feeds on the leaves of trees. Many beetles are neutral ; that is to say they do not interfere directly or indirectly with man. The water beetle is one of these. It lives in ponds and streams and feeds on water animals and insects.

1 : *198*, 200, 208–212

Bering, Vitus, a Danish sailor who discovered and surveyed the Bering Sea for Russia's Peter the Great. He lived from 1680 to 1741.

3 : 338

belemnite, see FOSSIL.

Belgium, a country of western EUROPE bordering the North Sea. It has large mining resources. The chief towns are BRUSSELS, the capital, and Antwerp. **2** : *152–153*

bell, electric, one which is made to ring by the use of an electric current. See also ELECTRICITY. **4** : 161

bell animal, see VORTICELLA.

Bellini, Giovanni, member of a famous family of Italian portrait-painters of the Venetian school and painter of many frescoes and religious subjects. He lived from about 1426 to 1516. **5** : 119, 133

Bellini, Vincenzo, Italian composer of operas, who lived from 1801 to 1835. **5** : 244

bell-ringing, the art of playing tunes on bells, properly called campanology. **5** : 255

Benz, Karl, German engineer who invented the two-stroke engine and built an early car. He lived from 1844 to 1929.

4 : 125

Beowulf, the Old English epic poem which no doubt came to Britain with the invading tribes from the Continent—the Angles, Saxons and Jutes. It tells about the hero, Beowulf, who sought out and killed a dreadful beast, Grendel, half monster, half magical, which had long preyed upon his friends, seizing them in the night and carrying them off to the depth of a dreadful lake where it lived with its equally horrible mother. Later, he

fought and slew a dragon. The poem tells us of the everyday life of a society that existed before the days of written history and is now lost in the mists of time. **5** : 15–16

Berlin, the capital of pre-war GERMANY on the river Spree. The population is over 3 millions. **2** : *152*

Bessemer, Sir Henry, the British engineer who invented the BESSEMER CONVERTER for turning iron into steel. He lived from 1813 to 1898. **4** : 255

Bessemer converter, an apparatus for making STEEL.

4 : 255

Bible, a collection of 64 books in one volume. These are divided into the Old Testament, which is largely a history of the Jewish people; and the New Testament, which consists of four accounts of the life of Jesus, known as the Gospels, together with the letters of St. Paul relating to the founding of the Christian Church and the missionary efforts of Christ's followers, and other matters. The book is the source-book of the Christian faith, and the Gospels in particular form the guide-book to the Christian life. The most famous Protestant translation is the Authorized Version of James I. Roman Catholics use a different version called the Douai Bible. **3** : 203–205 ; **5** : 39–45 ; **6** : 190–210

The most famous stories in the Bible are the parables of Jesus (**6** : 206–210), being so simple that any child can understand them yet teaching their lessons with great power. Who can forget the story of the Good Samaritan or The Prodigal Son? Whatever their religion may be, people can see the point of these stories and see that it holds good for all humanity. Christians believe that JESUS Christ came to earth in order to be able to tell these stories in His own words and so help mankind to live.

bicycle, a two-wheeled vehicle, driven normally from pedals.

4 : 26, 102

An earlier form of this machine is the penny-farthing (**4** : 184).

biennial, a plant that during the first year of its life grows only roots and leaves. It flowers and seeds in the second year, and then dies. See also ANNUAL and PERENNIAL. **1** : 247

Big Ben, the clock on the Houses of Parliament, London, the chimes of which are used as the time-signal of the B.B.C.

4 : 376, 382–383

bill, in Parliament, a proposed new law. Most bills are

put forward by the Government but may be introduced by any member. They must be discussed and voted upon three times in the Commons and then in the Lords. A bill which has been passed by both Houses receives the Royal assent and becomes law. If a bill is rejected by the House of Lords, it still becomes law if passed again by the Commons after the interval of a year. **3** : 373

bill hook, a kind of hatchet with a long blade, a wooden handle, and a curved point. It is used for cutting thorn hedges, or for lopping. **1** : 345

binder, an attachment to a reaping machine for tying bundles of grain cut and thrown off. Often the whole machine is called a binder. **1** : 335–336

biology, the study of living things, embracing botany (the study of plants) and zoology (the study of animals). **1** : 12

birch, an attractive tree having a silvery-white trunk, with a shiny bark. **1** : 237, 253

bird of paradise, a New Guinea bird related to the crow but with beautifully coloured feathers. **1** : *117*, 122

birds, warm-blooded animals with backbones. The young are hatched from eggs. They are light in bone structure and feathered, being adapted for flying. But some, like the OSTRICH and PENGUIN, have lost this power. **1** : *78*, 79–124, *95–96*, *105–108*, *117–118*, 320, 325

birds of prey, those birds like HAWKS and OWLS that feed on other birds and small animals. They have powerful, hooked beaks and strong curved talons, See also EAGLE, FALCON, VULTURE. **1** : *106–107*, 111–116

bird-table, a board nailed to the top of a post driven into the ground so that the table part is about 4 feet high and easily seen from your window. By leaving food on the table you can observe the birds while knowing that they are safe from cats. **1** : *78*, 79–80

bird-watching, a hobby which makes you a methodical observer of birds whether in the country or in the garden. The bird-watcher soon becomes skilled at identifying birds and learns a great deal about their behaviour. **1** : 79–80

Birmingham, the city famed as the centre for manufacturing metal goods of all kinds. The population is over 1 million. **2** : 279

Bismarck, see GERMANY.

bison, a sort of wild cattle with large shaggy head and a great hump on the shoulders. They used to live in great herds in North America, where they formed the food of the RED INDIAN. They have been hunted with modern guns till few remain. They are often wrongly called BUFFALO. **1** : 22, 313

bivalve, a MOLLUSC with a hinged shell in two halves, such as the OYSTER. **1** : 18, 156

black, the absence of colour. We say an object is black when its substance absorbs all the light rays which fall on it. See WHITE and COLOUR. **4** : 343

blackberry, the fruit of the bramble, a common bush, plentifully supplied with prickles. The blackberry we eat is made up of a number of tiny purplish fruits clustered together. **1** : 238

blackbird, one of the best song-birds in Britain and a great frequenter of gardens. **1** : 82, 86, *95*, 288–289

Black Death, a plague from the Far East which spread over Europe and carried off a third of the population of England during the years 1348 and 1349. **3** : 137–138, 380

Blackmore, R. D., a Victorian novelist whose fame today rests on one book, *Lorna Doone*. He lived from 1825 to 1900. **5** : 60

Black Prince, the name given to the son of Edward III, who "won his spurs" at the battle of Crécy. **3** : *2*, *134*, 135–137

Black Sea, an inland sea, north-east of the Mediterranean. **2** : *152–153*, 247

blacksmith, a man who makes and fits shoes to horses, and fashions other iron goods. **4** : 252

bladderwort, an INSECT-EATING PLANT, which floats in the water of pools and ditches. Among its leaves are many little pitchers or bladders, which open by an elastic, door-like valve. Any small water creature entering this bladder is imprisoned until it dies, when its body is digested by the plant as food. **1** : 270–271

Blake, Robert, Cromwell's General-at-Sea during the Civil War and later, when war broke out with the Dutch in 1652, England's most successful admiral. He lived from 1599 to 1657. **3** : 215–217

Blake, William, English poet and painter who lived at the

time of Wordsworth and Coleridge. An engraver by profession, his water-colours on Biblical themes are like visions of another world, stronger and starker than our own. His poems have a sort of natural simplicity like that of a very young child. He lived from 1757 to 1827. **5** : 150

blast furnace, the furnace in which iron is smelted out of the rock which contains it. See IRON ORE, STEEL WORKS and IRON AND STEEL INDUSTRY. **4** : *253*, 255; **2** : 282–283

Bliss, Sir Arthur, English composer of ballet and orchestral music. He is Master of the Queen's Musick. He was born in 1891. **5** : 251

blister, a small cavity under the skin filled with a watery liquid. It is usually caused by an injury or by disease. **1** : 376

Blondel, RICHARD I's minstrel, who found his master a prisoner in Austria. **3** : 89–90

blood, the fluid which circulates in the bodies of most animals. It is made up of a yellow fluid called plasma, and minute cells called corpuscles.

There are two kinds, white corpuscles, which destroy harmful germs that get into the body, and red corpuscles that carry oxygen from the lungs to all parts of the body. A fluid called HAEMOGLOBIN gives the colour to the red cells. See also BLOOD-VESSELS ; CIRCULATION.

1 : 362, 364, 367–372, 376

The CIRCULATION of the blood was discovered by William Harvey, an English physician who lived from 1578 to 1657.

blood-vessels, the channels through which blood flows to all parts of the body. ARTERIES carry the blood away from the HEART, and VEINS carry the blood back to the heart. See also CAPILLARIES. **1** : 369–371, 376

Blücher, Gebhard von, the German general who joined with the Duke of Wellington in defeating Napoleon at Waterloo. He lived from 1742 to 1819.

3 : 278

bluebottle, see FLIES.

Blyton, Enid, a favourite children's writer, one of the most popular for boys and girls in the 20th century. **6** : 28–29

boa constrictor, a large snake of South America that crushes its prey. **1** : *135*

Boadicea, Queen, a warrior-queen of a British tribe who led

a revolt against the Romans. She lived in the 1st century A.D. She is also called Boudicca. **3** : 22

Boers, Dutch colonists in South Africa and their descendants. **3** : 330, *331–332*

Boer War, see SOUTH AFRICA.

boiler, used for driving steam-engines of great power. In the water-tube boiler, the water is in tubes passing through the furnace so that it will readily turn to steam. **4** : 36, *37*

boiler, kitchen, usually a small furnace surrounded by an outer chamber in which water circulates and warms before passing to a hot-water tank for household needs. **4** : 36

boiling point, the temperature at which a liquid turns to vapour. The boiling point of water is 100 degrees Centigrade or 212 degrees Fahrenheit.

4 : 44

boleadoras, a South American weapon used to entangle the legs of animals. It is made up of a rope, weighted with two or more balls or stones, swung round the head and hurled at the animal being chased. **1** : 309

Bolivia, an inland South American republic which is rich in minerals, and has a population of 3 millions. The official capital is Sucre, the largest town, La Paz. **2** : *165*

Bombay, a large seaport on the west coast of INDIA. The population is over 3 millions.

2 : *158*, 235

bones, the framework, or internal SKELETON, of animals with backbones. They support the body and protect the internal organs, and with the help of the MUSCLES and TENDONS they enable the body to move about. See also JOINTS : SKULL.

1 : 361, 364, 372–76

Bonnie Prince Charlie, see STUART.

book-binding, the final stage in the making of a book.

4 : 304–306

Boswell, James, a Scottish laird who became the friend and

companion of Dr. Samuel JOHNSON, later writing what is held to be the best biography in English literature, that of Dr. Johnson and his circle. He lived from 1740 to 1794. **3** : 239

Bothwell, Lord, see MARY QUEEN OF SCOTS.

Botticelli, Sandro, an Italian painter who lived from 1444 to 1510. Botticelli was a master of the use of line, and the rhythmic effect of movement he obtained in all his pictures approaches that of Chinese art. His picture of *Pallas Taming a Centaur* is a fine example of his work. **5** : 121

bower bird, a type of crow-like bird of Australia and New Guinea. In order to attract the hen bird, so that it can "display" before her, the cock bird builds a bower of twigs and mud against a tree and decorates it with a collection of colourful oddities such as bones, feathers, flowers, etc. **1** : 94

Boys' Brigade, an organization for boys, linked to church membership. **3** : 347–348, *349*

Boy Scout, see SCOUT.

bracken, a very common coarse FERN, abundant on hillsides. **1** : 261

Brahms, Johannes, German composer who lived in Vienna. He was the last of the great classical composers of whom Beethoven, his predecessor, was his chief inspiration. He wrote four SYMPHONIES, four CONCERTOS, and much chamber and piano music. He lived from 1833 to 1897. **5** : 233, 239–240, *248*

brain, a mass of greyish matter in the skull which is the nerve centre of the human body. **1** : 374, 376–381, 383

bramble, a prickly SHRUB, such as the blackberry or raspberry bush. **1** : 340, 345

brass instruments, in music, see ORCHESTRA.

brass-rubbing, the hobby of making impressions of the pictures engraved on the brass memorials over graves in old churches. **5** : 302–304

Brazil, a Republic and the largest country in South America. Rich in mineral wealth, it has also many coffee estates. A new capital Brasilia is being built ; the chief river is the AMAZON. **2** : 305–308

breathing, the process by which air is taken in and driven out by the LUNGS. **1** : 365–368

breeds of animals, types of domestic animals that are the best of their kind for special purposes, and whose offspring

not only have the same good qualities but may be even better than their parents. For example, certain breeds of CATTLE are noted for the good quality of their milk, while others are best for beef. In the same way, chickens, horses, and sheep are bred for their special qualities.
1 : 313–315, 317–318, 353, 358–360

briar, any plant with a woody, prickly stem, such as the rose or the blackberry.
1 : 340, 345

bricks, a common building material made of baked clay.
4 : 313

bridge, a structure to carry a road or track over a river or stream. 4 : 190–191

Bridgewater, Duke of, a mine-owner, who pioneered the building of canals as a chief means of transport. He lived from 1736 to 1803. 3 : 268

Brindley, James, a British engineer and famous builder of canals. He lived from 1716 to 1762. 3 : 268

Britain, see GREAT BRITAIN.

British Commonwealth of Nations, the association of free nations that have developed from the old BRITISH EMPIRE. Sometimes the term is used to include British colonies and protectorates as well. 3 : 362

British Empire, the territories once governed from Great Britain. It covered more than a quarter of the world. As individual members of the Empire have obtained self-government, the empire has developed into the free association of the BRITISH COMMONWEALTH.
3 : 361–362

British Guiana, a British colony in South America between Venezuela and Surinam. The chief products are sugar, rum, timber and minerals. The capital is Georgetown.
2 : *164–165*

British Isles, the group of islands in north-west Europe, comprising GREAT BRITAIN, IRELAND, the Isle of Man, the Orkneys, the Shetlands and many other islands.
2 : *147, 152–153*

Britons, Ancient, the people inhabiting the island of Britain before the coming of the Romans. They were CELTS.
3 : 16–22

Britten, Edward Benjamin, modern English composer noted for his operas, among which are *Peter Grimes*, *Albert Herring* and *Billy Budd*. He was born in 1913. 5 : 249

brittle star, see STARFISH.

broad bean, see BEAN.

broadcasting, the sending out by radio waves of all the entertainments, music, news and talks that can be heard on the home RADIO or TELEVISION receiver. 4 : 182–183

brontosaurus, a giant reptile of prehistoric times. It was about seventy feet long and lived on mosses and other plants.
1 : 280, *282*

broom, a SHRUB growing to about five feet in height. It is found on heaths and commons and bears small attractive yellow flowers. Occasionally it has a few prickles. 1 : 236

Browning, Robert, an English poet whose work is rough-hewn and strong-sounding rather than smooth and glossy. His interest in people is as keen as any novelist's, and many of his poems are pen-pictures of

men and women. Children know him as the poet of *The Pied Piper of Hamelin*. He lived from 1812 to 1889.
5 : 24, 98, 103

Bruce, Robert, King of Scotland, continued the struggle of William Wallace against the English armies of Edward I who tried to conquer the Scots. He gained the final victory over his son Edward II at the Battle of Bannockburn in 1314 which achieved Scotland's independence. He lived from 1274 to 1329. 3 : 128

Brueghel, Pieter, a Flemish painter of the late Middle Ages whose work brings the everyday life of his times before us with extraordinary freshness, humour and clarity. He lived from 1525 to 1569. 5 : 141

brush turkey, a large turkey-like bird of Australia ; several brush-turkeys scrape together a huge mound of leaves in which the hen birds lay their eggs. 1 : 94

Brussels, the capital of Belgium. The population is nearly 1 million. 2 : *152*

Buchan, John, a follower of Stevenson and author of *Greenmantle* and *The Thirty-nine Steps*, spy stories of the First World War and ranking among the best ever written. He was made Governor-General of Canada and later Lord Tweedsmuir. He lived from 1875 to 1940. 5 : 70

bud, a small growth at the tip or on the side of a stem, that

later may grow out as a flower or group of flowers, a leaf, or a new stem or branch. Some plants form a BULB from a bud, in which to store food. 1 : 231

Budapest, a city on the river Danube and the capital of Hungary. The population is over 1¼ millions. 2 : *152*

Buddha, one of the world's greatest religious teachers. Born on the border of Nepal into a noble family he left the comforts of wealth and power to solve the problems of misery, suffering and old age. He came to believe that our desires lead to misery, that the path to peace of mind and the end of suffering was through abolishing one's desires. He lived from about 560 to 480 B.C. Today he has millions of followers. 6 : *408*

Buenos Aires, capital of Argentina, on the estuary of the River Plate, and the port whence the frozen beef of Argentina is sent to many parts of the world. It is the largest city in the southern hemisphere, with a population of nearly 4 millions. **2** : 197–199

buffalo, wild cattle of Asia and Africa, the African variety being among the most tricky and dangerous of animals to the hunter. The Asian buffalo is often tamed. They have nothing to do with the American BISON. **1** : 23

There is also a dwarf variety known as the Congo buffalo (**1** : *30*) with a bright red coat and small horns that sweep backward.

building, the construction of houses, factories and other useful buildings. **4** : *312*, 313–318

Building materials (**4** : 313–315) are of many kinds—stone blocks, wood, bricks (**4** : 313), wattle and daub (**4** : 314), concrete and steel (**4** : *312*, 315), plasterboard for ceilings, glass wool for keeping in the heat, even rubber for some kinds of flooring.

The actual building of a house is depicted in **4** : 316–317. See also ARCHITECTURE, HOMES.

bulb, a large plant organ or BUD, usually underground, made up of overlapping, scale-like

leaves. It is used for food storage. Examples of plants which grow from bulbs are the onion, tulip, daffodil and lily. **1** : 231

Bulgaria, a country of south-east Europe on the western shores of the Black Sea. The chief products are wheat and tobacco. The capital is Sofia. **2** : *152–153*

bumble-bee, a large wild bee with a loud hum, producing very little honey. **1** : 220

Bunsen, Robert Wilhelm, a 19th-century German scientist who invented the Bunsen burner, a simple device which mixes coal gas with air so as to give a much hotter flame when lit. This principle is now used in our gas stove burners. **4** : 49–50

Bunyan, John, a Puritan during the Civil War, he became a Baptist and was imprisoned for preaching according to his beliefs. His great work, *The Pilgrim's Progress*, was partly written in gaol. He lived from 1628 to 1688. **5** : 45

buoy, a floating sign for ships sailing in and out of harbour and giving information about safety or direction. **2** : 145 ; **4** : 211–212

Burbage, James, builder and owner of "The Theatre," Shoreditch, in which plays were produced. Shakespeare was an actor in Burbage's theatre. He lived from 1530 to 1597. **5** : 80

burdock, a common weed in most waste places. It is tall and coarse with a purple flower-head containing many hooks. This frequently sticks to the coats of passing animals. See also SEED. **1** : 238

Burghley, Lord, English Secretary of State and chief adviser to Queen Elizabeth I. He lived from 1520 to 1598. **3** : 175–178

Burma, a country in south-east Asia on the eastern shores of the Bay of Bengal. Rice is the chief agricultural produce but mineral resources are of great importance, especially petroleum, rubies and sapphires. The chief rivers are the Irrawaddy and Salween ; the chief towns, Rangoon, the capital, and Mandalay. **2** : *158–159*

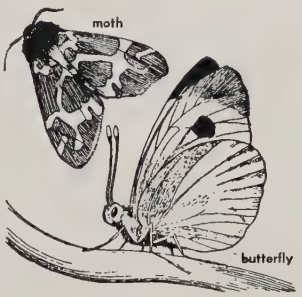
Burns, John, Scottish engineer and politician who led strikes in the 1880's that helped to raise the working class standard of life, especially of the London dockers. He lived from 1858 to 1943. **3** : 324–325

Burns, Robert, self-educated farm-lad who became Scotland's best-loved poet through his poems written mainly in Scots dialect. Poor in worldly goods, he was independent in mind and spirit and directed his rugged humour against the proud and powerful. But his tender-hearted love-songs place him high among the world's lyrical poets. He lived from 1759 to 1796. **5** : 101

bushman, one of a race of stunted little yellowish-brown huntsmen, natives of South Africa. There are very few of them left today. **1** : 310

buttercup, a common wild plant with bright yellow flowers, found mostly in meadows in spring and in the summer. **1** : 231

butterfly, an INSECT with soft, colourful wings that flutters from flower to flower and unrolls a long, tongue-like tube in search of nectar. Butterflies differ from MOTHS in having knobbed or club-shaped feelers (antennae), and in the way their



wings fold upwards when at rest. Most butterflies, too, fly by day, whereas moths are generally night insects. The female lays eggs which soon hatch out into CATERPILLARS, feeding on the leaves of certain plants. The caterpillar then has a resting stage while undergoing a further change. While it is in this stage it is known as a pupa or chrysalis. The pupa is covered with a silky protective case called a cocoon. When it has changed into a fully-grown insect, it will come out of its little case as a winged butterfly, able to fly away, lay its eggs, and start the process all over again. Such a change is called METAMORPHOSIS.
1 : *186–7*, 189–192, 200, 291–292

butterfly collecting, an interesting and useful hobby for the young naturalist. **5** : 312–314, *318–319*

butterfly-fish, found amongst coral reefs, are brightly coloured red, blue or yellow with black or white bands. They have a tube-like mouth and long, bristle-like teeth which make it easy for them to search crevices in the rocks for food. **1** : 171

butterwort, a beautiful little bog or marsh plant which traps and eats insects. The surface of its leaves is covered with a sticky substance that turns the leaves into miniature fly-papers. Once a victim is trapped and dies its body is washed into a trough in the leaf, whence the leaf gradually folds over it and the plant begins to digest its meal. See also INSECT-EATING PLANTS. **1** : 270

buttress, a square pillar built against the outside of a wall to

resist the outward thrust of a vaulted roof, as in a cathedral. **5** : 201

buzzard, a large brown BIRD OF PREY, fairly common in Wales and the south-west of England. It is sometimes mistaken for the eagle. **1** : *106*, 116

buzzer, an electric device which buzzes when a current passes through it. **4** : 158–159

C

cabbage, a widely used green vegetable, with thick overlapping leaves in a dense head. **1** : 201, 355 ; **6** : *59*

cable-laying ship, a ship for laying the cable wire to carry messages from country to country over the ocean-bed. **4** : 173

Cabot, John and Sebastian, Bristol explorers of Italian origin. John discovered Newfoundland. He lived from 1450 to 1498 and Sebastian from 1474 to 1557. **3** : 159

cactus, a plant which grows in desert places. Its leaves are usually reduced to spines to prevent loss of water, and it has

thick fleshy stems in which water is actually stored. Many cacti have beautiful but short-lived flowers. **1** : 266–269

Cadbury, George, an English chocolate-manufacturer who built a model village for his workers and so pioneered the way to better housing for the less well-off. He lived from 1839 to 1922. **3** : 382–383

Caedmon, a 7th-century herdsman who became a monk and the writer of some of the earliest religious poetry in England. **3** : 43–51 ; **5** : 16–17

Caesar, Gaius Julius, a Roman soldier and statesman who founded the Roman Empire, conquering Gaul and invading Britain. He made and

wrote history, becoming dictator, and was finally assassinated in the Senate. He lived from about 100 to 44 B.C. **3** : 17

Cleopatra was a beautiful Queen of Egypt with whom Julius Caesar fell in love. Later she was loved by another Roman Mark Antony, who had charge of the eastern part of the Roman Empire. His was a love which ended in tragedy and death for both. See ANCIENT WORLD.

Caiaphas, the High Priest who was the chief opponent of Jesus among the clergy and sought His death. **6** : 199–200

caiman, a South American reptile like the alligator. **1** : 142

Cairo, the capital of Egypt on the east bank of the Nile, with a population of more than 2 millions. **2** : 33, *37*, *154*

calcium, a silver-white, soft metal, found naturally only in compounds. **1** : 376

Calcutta, a city of eastern INDIA on the River Hooghly. The population is over 2½ millions. **2** : *158*, 235

calendar, a device which tells us the date. **6** : 106

calorie, a unit of heat. It is used especially for measuring the value of foods for producing heat and energy in the human body. **1** : 362–363

calyx, see SEPAL.

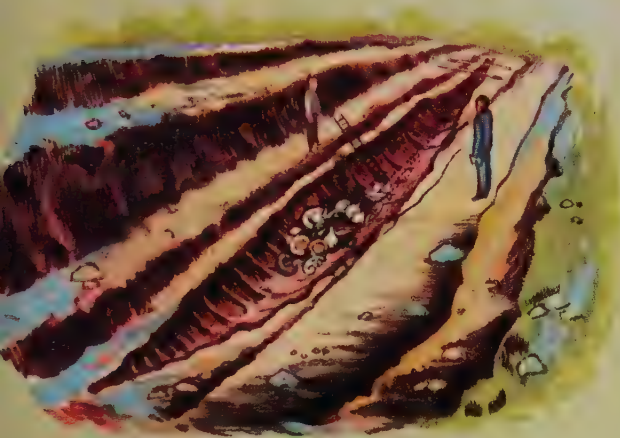
camel, a desert-dwelling animal used as a beast of burden. Its large splayed feet help it to walk on soft loose sand and it can live longer than most animals without food or water, as it can carry in its body a reserve supply of both. The Bactrian camel of Asia has two humps on its back, the Arabian camel, of the African and Arabian deserts, has only one. The dromedary is a breed of Arabian camel, specially bred for speed and used as a riding-camel. **1** : 36–37, 315–316, 320

camera, a device for taking PHOTOGRAPHS. See also FILM and TELEVISION. **4** : 346–348

camera obscura, a device which can be a dark box or a dark room into which light is permitted to enter through a small hole or lens in such a way as to produce a bright picture of the outside world reflected on a white surface. **4** : 334

camouflage, a disguise. To camouflage something means to hide it by making it more difficult to see. There are various

the ruins of Pompe
a Roman city ove
whelmed and buried
lava from a volca



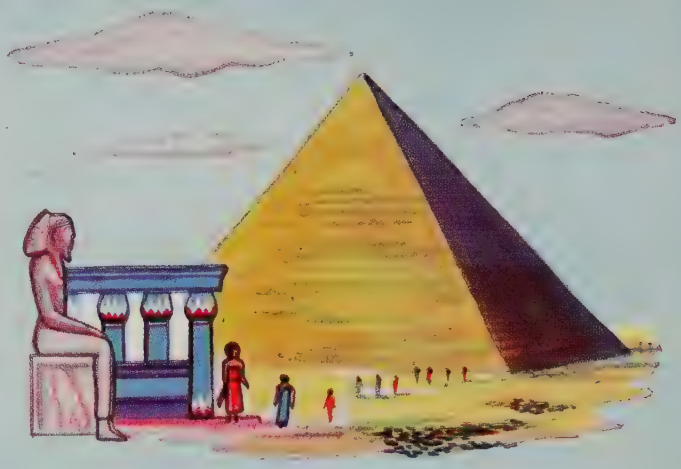
outlines of an Anglo-Saxon ship, now rotted away, buried with a chief's hoard of silver plate and other valuable objects

Egyptian pharaoh's tomb discovered inside a pyramid

ruins of a stronghold of the Incas amidst the lonely mountains of South America

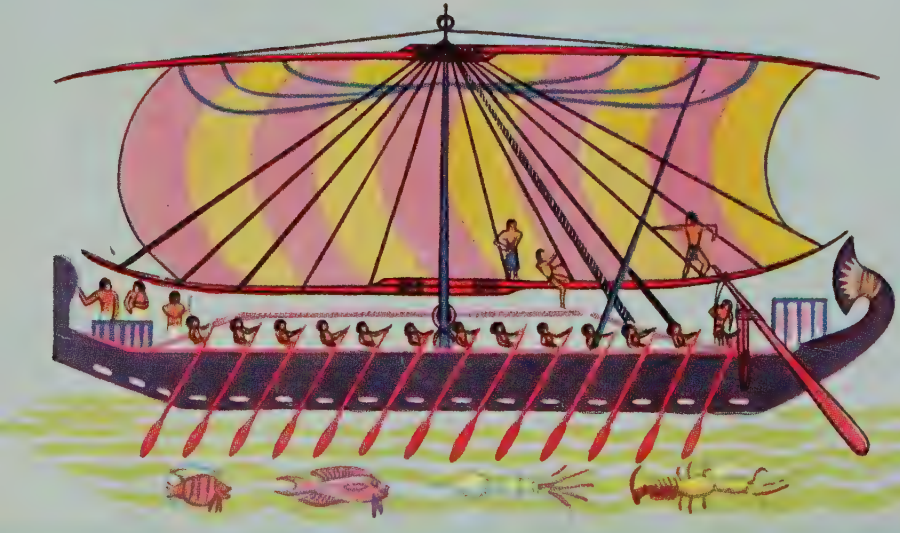
DISCOVERIES MADE BY ARCHAEOLOGISTS WHILE STUDYING THE PAST

picture writing in ancient Egypt



pyramid, a royal tomb

a Pharaoh and his court



Egyptian boat

SCENES FROM THE LIVES OF THE ANCIENT EGYPTIANS

forms of camouflage in nature, such as that resulting from the ZEBRA's stripes, or the pattern of the woodcock. See also MIMICRY.
1 : 291–292, *293*, 295–296

Campbell, Thomas, Scottish poet who wrote *Ye Mariners of England, Lord Ullin's Daughter* and other romantic pieces. He lived from 1777 to 1844. 5 : 99

camping, a pastime requiring thorough preparation at home. Clothes, rucksack, kitbag, tent and groundsheet must be in good order, and you must know about camp fires, camp sites and camp cooking. 6 : 227–231, *256*

Canada, in the northern half of NORTH AMERICA and one of the nations of the BRITISH COMMONWEALTH. It has great industries based on its natural resources—timber, iron, asbestos, uranium, nickel and other minerals. Its great central plains produce an immense amount of wheat. The country is divided into ten provinces, Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland (with Labrador), Nova Scotia, Ontario, Prince Edward Island, Quebec, and Saskatchewan; plus the two territories—North-west Territories, and Yukon Territory. The chief cities are MONTREAL, Toronto, VANCOUVER and Winnipeg and the capital is OTTAWA. Canada's population is over 17 millions. See also ROCKY MOUNTAINS.
2 : *162–163*, 178, 328, *332*

In the late 17th and 18th centuries there was rivalry in Canada between French and British traders. This ended when France and Britain went to war and the siege and capture of Quebec by General WOLFE in 1759 caused the whole of Canada to become a British possession. (3 : *244*, 245–246, 258, 362–366.)

canal, a man-made waterway to enable boats to pass through a countryside as vehicles do on a road. Canals in Britain were built in the latter part of the 18th century, but since the spread of railways a number of them have fallen into disuse. The most famous canals, however, like the Suez and the Panama canals, have been deep channels cut through narrow necks of land to enable large ocean-going vessels to find a short cut between two seas.
4 : *84*, 192–194; 3 : *266*, 267–268

Canberra, a city and the capital of the Commonwealth of Australia. 2 : *161*

candle, a thin wick embedded in a wax cylinder. When the wick is lit the wax slowly turns to vapour and burns to give a steady light. 4 : 47–48, 300

"Canterbury Tales," see CHAUCER.

Canute, a Dane who with his father conquered much of England and became king. He became a Christian convert and ruled well. He lived from 995 to 1035. See DANES. 3 : 56–61

Cape Town, a seaport and one of the capital cities of the Union of SOUTH AFRICA. The population is over 700,000.
2 : *154*, 230–231

capillaries, tiny thread-like blood-vessels in the blood system of the body. See also CIRCULATION. 1 : 369–371, 376

capuchin, a small monkey of the kind that used to be taken round by Italian organ-grinders.
1 : 76–77

capybara, the largest rodent in the world. It is related to the guinea-pig, but grows to the size of a small sheep. It comes from South America where it spends much of its time in rivers, being an expert swimmer.
1 : *41*

Caractacus, a British chieftain who resisted the Romans for nine years before being captured and taken to Rome. He lived in the 1st century.
3 : 18–22

carbon dioxide, a gas contained in our breath when we breathe out. 1 : 367–368; 4 : 358

Cardiff, the capital of Wales and its chief industrial centre. Its population is over a quarter of a million. 2 : *148*

caribou, a wild form of the reindeer, found in the arctic regions of North America. Unlike all other DEER, both males and females carry antlers.
1 : 44, 303; 2 : 57

caricature, a funny drawing of an actual person, in which the artist exaggerates the little oddities of the person. 5 : 163

carnivores, the name given to animals that live on the flesh of other animals; curiously enough, the BEAR, although it is a carnivore, eats both animal and vegetable matter and includes less meat in its diet than other animals in this group. These include the BADGER, FOX, HYENA, LEOPARD, LION, OTTER, STOAT, TIGER and WEASEL. See also CATS. 1 : *20*, *32*, 45–50

carpel, the female parts of a plant, which make up the OVARY and contain the egg-cells from which new seeds are formed when FERTILIZATION has taken place. 1 : 231, *233*

Carroll, Lewis, an Oxford University lecturer in mathematics who wrote *Alice's Adventures in Wonderland*, the story of a little girl who followed a rabbit down a rabbit-hole. His real name was the Rev. Charles Dodgson. He lived from 1832 to 1898. 5 : 27–28, 98, 166

carrot, a plant whose long tapering root is cooked and eaten as a vegetable, or served raw with salads. 1 : 230

Carthage, see ANCIENT WORLD.

Cartier, Jacques, a French explorer who sailed up the St. Lawrence river in Canada; his efforts to establish a French colony in Canada met with no success. He lived from 1491 to 1557. 3 : 246

cartilage, see GRISTLE.

cartoon, a drawing which satirizes some contemporary event, often political, and usually employing CARICATURE. 5 : 164

cartoon film, a type of film built up from many thousands of separate drawings. 4 : *352*, 353

Caruso, Enrico, famous Italian operatic tenor, who lived

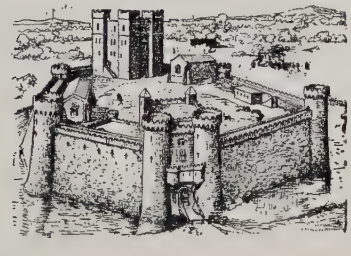
from 1873 to 1921. Although he appeared in practically every leading opera house in the world, he reached an even wider audience through his gramophone records. He was one of the first operatic artists to allow his voice to be recorded. **5** : 241

Cassivelaunas, a British chieftain distinguished for holding out against Caesar's second invasion. **3** : 18

cassowary, a flightless bird of Australia and New Guinea with a strange bony lump on its head. **1** : *118*, 124

casting metal, the process of melting metal and pouring it into moulds, which will give it a desired shape (such as a hammer head) when it cools and solidifies. **4** : 256–257

castle, a large, strongly fortified dwelling. A large number



were built by the Norman barons when they occupied England, for the protection of themselves and their servants and the nearby villages.
3 : *76*, 77–78, 118–119 ; **5** : 191–196, *193*

caterpillar, the LARVA of BUTTERFLIES and moths. It looks quite different from the adult it will eventually become, being worm-like, with many legs. **1** : 190–191, 193, 199, 201

Catesby, Robert, see FAWKES.

catfish, any of a number of fresh-water and marine fishes, varying in length from a few inches up to ten feet. Some species have whiskers round their mouths and others have poisonous spines on their backs. All types are fierce. **1** : *176*

cathedral, a church at which a bishop has his seat, or headquarters. It is usually large and beautifully decorated. Some famous cathedrals are St. Peter's in Rome, Notre Dame in Paris, and Canterbury Cathedral. Many cathedrals are seven hundred, or more, years old, but modern ones are still built.
3 : 38, 85–87 ; **5** : *193*, 197–201

cathode-ray tube, a piece of electronic apparatus which

forms the viewing screen in a radar or television set. **4** : 354, 357

catkin, a drooping group of flowers, each flower being of one sex only. They are found on oak, hazel, alder and other trees. The wind carries the pollen from the male to the female catkins. **1** : 237

cats, the name given to the family of flesh-eating MAMMALS that includes the LEOPARD, LION and TIGER, and many others, as well as the domestic cat. They have keen sight and hearing and stalk their prey slowly and silently. The chief characteristic of cats is that they can all draw their claws into protective horny sheaths, with one exception. Of the many kinds of domestic cat, the tabby, with its stripes and short hair, probably bears the closest resemblance to the original wild cats. Some cats are bred specially for show, and include the Persian, with long, silky hair of a smoky blue colour, the Siamese, which has short hair, a long, pointed head and a gruff voice, and the Manx cat, which has no tail. **1** : *32*, 33, 43

The cheetah, or hunting

leopard, is the only cat that cannot draw in its claws completely. It is different from other cats, also, in running down its prey instead of stalking and pouncing. It can reach a speed of seventy miles an hour but cannot keep it up over a distance of more than a quarter of a mile. Because it could run so fast, the cheetah was often used in earlier days by Indian princes, to hunt other animals. Formerly found in great numbers in Asia and in Africa, the cheetah is now becoming scarce. The jaguar lives in the forests of South America, and is about the same size as a leopard, but rather heavier in appearance. Its coat is spotted in a pattern of rosettes (**1** : *32*). Another big cat found in North and South America is the puma, or cougar. It is also called the mountain lion, but is equally at home in the plains and deserts. It can cover a distance of twenty feet in one bound.

cattle, domestic animals kept for their milk, their flesh (beef), and their skins. Females are called cows, and males bulls or bullocks. See also OX, YAK, ZEBU.
1 : 314–317 ; **2** : 192–195

Cattle that provide good milk are called dairy cattle, and include Dairy Shorthorn, Jersey, Guernsey, Ayrshire and Friesian breeds (**1** : 358–359). Beef cattle include Aberdeen Angus and Hereford (**1** : 315, 358–359), and another type of Shorthorn also provides good beef.

Cavaliers, see CHARLES I.

cave art, paintings found on the walls of caves mainly in France and Spain and done by man in his savage state before the days of known history. **5** : 112–115, *114*

Caxton, William, the first English printer. He lived from 1422 to 1491. **3** : 155–156

cell, a very tiny unit or mass of substance, known as PROTOPLASM, of which the bodies of all animals and plants are built. The human body is made up of more than a hundred billion cells ; the amoeba is made up of one cell only. **1** : 228

cello, the violoncello, a stringed instrument like a very large violin but much lower in

pitch, and used both as solo instrument and as part of the orchestra. It stands upright between the knees, whereas the violin is small enough to hold under the chin. **5** : 225

Celts, the people inhabiting much of western Europe at the time of the Romans. Successive waves of them invaded Britain —the Goidels, with the knowledge of how to make bronze, were followed by the Brythones or BRITONS, with a knowledge of how to smelt iron. **3** : 16–22

cement, a substance made from ground limestone. Mixed with sand and small stones it makes concrete. **4** : 314

centipede, a flesh-eating animal which does not, as its

name implies, have a hundred legs. They number between thirty and forty. The centipede benefits the farmer by eating many insects harmful to his crops. The millipede, a close relative, has many more legs, destroys roots, and forms part of the centipede's diet. **1** : 204

Cervantes, Miguel de, the greatest Spanish writer, lived at the same time as Shakespeare. His huge novel *Don Quixote* manages both to make fun of the high-flown works fashionable at that time and to present two unforgettable characters, the fantastic gentleman, Don Quixote, and his down-to-earth servant, Sancho Panza. He lived from 1547 to 1616.

5 : 50–51 ; **2** : 229

Cetewayo, a famous African Zulu king who fought a war with the British before being subdued. He lived from 1836 to 1884. **3** : 333

Ceylon, an island in the Indian Ocean south of India, and member of the BRITISH COMMONWEALTH. It has many large tea estates. The capital is Colombo. **2** : *296*, 297–299

chaff, the husks of grain and grass which are separated from the seeds by threshing. **1** : 347

Chagall, Marc, a Russian painter born in 1887. His compositions have a gaiety and a fairy-tale-like quality in the modern manner that are very appealing. Two well-known pictures of his are *Sleeping Poet* and *Snowing*. **5** : 159

Chamberlain, Neville, the British Prime Minister who tried to persuade Hitler to keep peace in Europe. He was succeeded by Churchill in 1940.

3 : 354

chamber music, music written for performance in an ordinary room as distinct from a concert hall. Such music is written for a small combination of instruments of which two violins, a viola and a cello are the commonest. Such a combination is called a string quartet. When a fifth instrument is added, say a flute, or oboe or harp or clarinet, the result is a quintet. Another common arrangement of chamber instruments is the trio composed of piano, cello and violin. See also SONATA. **5** : 240–241

chameleon, a LIZARD of the tropics that can alter its colour

through shades of green, brown, and grey, according to changes in the strength of light. Its eyes can move independently. It gets its food by flicking its tongue at insects. **1** : 134–137

Chancellor, Richard, an English merchant explorer, reached Moscow in 1553. He died in 1556. **3** : 172–173

changes of state, such changes as occur when solids change into liquids as when ice melts ; or liquids into gas, as when water turns to steam. Compare with CHEMICAL CHANGES. **4** : 43–46

chapter house, the meeting place of the clergy of a cathedral or abbey. **5** : 201

charcoal, fuel made by charring wood and used in former times for iron-smelting.

2 : 276 ; **3** : 229

Chardin, Jean Baptiste, French painter who lived from 1699 to 1779. He was well-known for his treatment of humble homely subjects, and could turn such things as a bottle of wine or a loaf of bread into a masterpiece. *The Shuttlecock* is a good example of his simple charming style. **5** : 134

Charles I, king of England. He insisted on treating Parliament with contempt ; refusing to agree that he should not tax people except with Parliament's consent. He dismissed three Parliaments and then ruled without one for eleven years. Civil War resulted with Parliament and its supporters, the "Roundheads," raising an army to fight the King and his friends, the "Cavaliers." Charles was defeated, tried and executed. He reigned from 1625 to 1649. See also CROMWELL.

3 : *2*, 122, 126, *210*, 211–212, 224, 343

Charles II, king of England. He lived abroad after the death of his father but was crowned king at the restoration of the

monarchy after the death of Oliver Cromwell. He reigned from 1660 to 1685.

3 : 126, 224, 343

chart, a sea-map, giving information of use to sailors.
2 : 144–145

Chaucer, Geoffrey, the son of a London wine-merchant,

fought as a young man in the war with the French and later became the first of the really great poets in English literature. *The Canterbury Tales* is his greatest work, providing us with an abundance of information about everyday life and character in the 14th century. It is a collection of stories in verse told by pilgrims to while away their journey, and is full of hearty humour and shrewd observation. He lived from 1340 to 1400. 3 : 86 ; 5 : 18, *19*

cheese labels, see COLLECTORS' HOBBIES.

chemical changes, occur when two or more substances combine to form a new kind of substance. 4 : 45–46

Hydrogen and oxygen combine to form water, and iron combines with oxygen to form rust (4 : 45–46). Compare with CHANGES OF STATE.

chemistry, the science that deals with the composition of substances and the action of one substance upon another. See CHEMICAL CHANGES. The first chemists were known as ALCHEMISTS. They sought a way of turning base metals into gold and in the course of their studies laid the foundations of science generally. 4 : 21, 45–49

cherry, the fruit of a small tree with shiny reddish-brown bark, pointed leaves, and clusters of early-blooming white flowers. The round red fruit is sweet and juicy.
1 : 238, 350 ; 6 : *60*

chervil, a very common but beautiful weed, sometimes called hedge parsley or beaked parsley. It bears lots of tiny delicate flowers and very many wedge-shaped, much divided leaves.
1 : 242

chest, the upper part of the body between the throat and the ABDOMEN. It is enclosed by the RIBS. 1 : 366–367, 370

chestnut, a tree from south Europe, where its nuts are ground into flour. The young timber is valuable for fencing.
1 : 218, 350

chicken, any young bird, usually applied to the young of the domestic fowl. 1 : 359–360

child-labour, the hiring of young children to work long hours for little money common in the 18th and 19th centuries, since there were no laws to stop employers from hiring children to work in factories and mines for long miserable hours. Sweeping chimneys was another hor-

rible way in which small children were forced to work. See INDUSTRIAL REVOLUTION.
3 : 234–235

Chicago, on Lake Michigan, the second-largest city in the UNITED STATES and a centre for the grain, lumber and meat-canning industries, being also a great inland port. 2 : 195

Chile, a country of South America occupying a long coastal area west of the Andes and Argentina. Rich in minerals, especially copper, nitrates, iron and sulphur. The chief towns are Santiago, the capital, and Valparaiso. 2 : *164–165*

chimpanzee, see APE.

China, a huge country of Asia stretching from Tibet in the west to the Pacific Ocean in the east. It has the largest population in the world—probably over 450 million people, most of them living on little more than rice and vegetables. Chinese civilization, however, is much older than that of Europe, and learning and the arts are prized. The famous Great Wall, in the north, is more than 2,000 years old. It was built to keep out invaders. Peking is the capital, and Shanghai the chief port and largest city. After a long period of social strife China has accepted a government which intends to make China a modern state on the Russian pattern.
2 : *158–159*, 247, 309, *313*

chinaware, see POTTERY.

chinchilla, a squirrel-like South American animal, much prized for its fur. 1 : *41*

Chinese art, a style of art which reached its greatest heights from about 627 A.D. to the early years of 900 A.D. This golden age of painting and poetry was revived again from 960 for about another 500 years. Paintings were executed with delicate brush and penwork, and Buddhist temples were decorated with some wonderful work. Glorious poetry was written, printing was invented, drama and the novel encouraged. 5 : *158–162*

chipmunk, a gnawing animal like a squirrel but smaller and striped. It lives on the ground in North America. 1 : *41*

chlorophyll, see PHOTOSYNTHESIS.

chocolate, see COCOA-TREE.

Chopin, Frédéric François, born in Poland, composer and pianist and one of the most brilliant and romantic figures of the 19th century. His music was mainly for the piano and consists of waltzes, dances, ballades and innumerable studies full of fire and dash or, in quieter mood, haunting beauty. He stands on his own musical height neither greatly influencing nor being influenced, but

putting into music his love of loveliness and his impetuous burning spirit. Worn out with the intensity of his life—the strain of composing and of giving piano recitals—he fell mortally ill when on a concert tour in Britain. He lived from 1810 to 1849, spending most of his life in France.

5 : *230*, 232–233, 237, 240, 271

choreographer, the composer of a ballet. He must invent what every dancer is to do at every moment of the ballet, and since everyone must be engaged in graceful or expressive movement and all the dancers must harmonize to make a beautiful and harmonious whole, this is no easy task. Indeed the telling of a story by means of dancing is so complicated that it cannot be put into words or written out as directions. Ballets can only be handed down from one generation to another by the older dancers teaching the younger dancers. 5 : 272

Christianity, the religion founded by JESUS CHRIST. See CHURCH OF ENGLAND, NON-CONFORMIST, ROMAN CATHOLIC CHURCH.

3 : 27–28, 36–39 ; 6 : 190, 210

Christmas cards, greeting cards that can be made by anyone of an artistic turn. You can paint them individually, or make a lino-block and print them. See LINO-CUTS. 5 : 352

Christmas tree, see SPRUCE.

chrysalis, see BUTTERFLY.

church, a building used for worship by Christians. The first small churches were built in Britain in Roman times ; later many larger ones were built by the Anglo-Saxons and Normans in their own style of ARCHITECTURE. New churches have continued to be built ever since, and today there are churches in every town and almost every village. Some churches contain interesting old tombs from which BRASS-RUBBINGS can be made. See also CATHEDRAL.

3 : 28, 73–74, 109

Church of England, the church set up in England after the REFORMATION. Although Protestant, it claims to be a reformed branch of the Catholic Church, and it has preserved government by bishops. It has spread to many countries. In the United States its members are known as Episcopalians.

3 : 164–166

Churchill, Sir Winston Spencer, the Prime Minister of

Great Britain during the greater part of the Second World War, whose leadership and inspiring speeches encouraged the nation to fight for victory.

3 : *2*, 355 ; 5 : 163

churn, a container in which milk or cream is stirred to make butter. It may also refer merely to a large milk container.

1 : 330–331

C.I.D., the Criminal Investigation Department, part of the detective branch of the police force. 3 : 374

Cimabue, Giovanni, an Italian painter who lived from 1240 to 1302. He was the most famous artist in Italy at that time, and the first to try to break away from the old, stiff mosaic type of art which was common at that time. He never quite succeeded in making his figures live, but one of his pupils, the great Giotto, fulfilled his teacher's hopes in starting a new style in painting. Cimabue's *Madonna and Child with Angels* is one of the few examples left to us of this artist's work. 5 : 120

circle, a perfectly round ring. It may be defined as a closed curve, every point of which is equally distant from its centre. 6 : 112

circulation, the flow of BLOOD round the body. The HEART pumps the blood to the LUNGS, where it collects oxygen. It then returns to the heart and is pumped round the body through ARTERIES and CAPILLARIES. Blood takes oxygen, and digested food from the intestines, to all parts of the body, and carries waste matter to the liver and kidneys. It flows back to the heart through VEINS, then to the lungs, where carbon dioxide is given out and a fresh supply of oxygen is taken in. 1 : 369–371

circus, usually a travelling show given in an arena within a huge tent. There are wonderfully skilled riders on horseback, acrobats who do daring feats, animals that perform strange tricks and clowns to make everyone laugh. 6 : 100

cistern, a tank for storing water, usually fitted with a device for stopping more water entering once a certain level has been reached. 4 : 80

Civil War, between the supporters of the English Parliament (Roundheads) and the supporters of King Charles I (Cavaliers), who sought to impose his will over Parliament. It lasted from 1642 to 1648, and ended with the victory of Parliament's forces under their principal general, Oliver CROMWELL. It was followed by the trial and execution of the king.

3 : *210*, 211–215

clamp, a covering of straw and earth under which potatoes can be stored. 1 : 356–357

clarinet, a smooth-toned, wood-wind instrument of treble pitch. A cylinder in shape, it has a mouthpiece with a reed at one end and a cone-shaped opening at the other. 5 : 227

Cleopatra, see ANCIENT WORLD, CAESAR.

Cleopatra's Needle, see EGYPTIANS.

clerestory, an upper row of windows along each side of a large church or cathedral.

5 : 198

click-beetle, see BEETLE.

climate, the normal weather of a country or region. Thus in most of Canada you get a long dry hot summer and a cold bracing winter with practically no spring, while on the west

coast of Scotland you get mildish weather for most of the year with much rain. **2** : 106–123

clipper, a famous type of sailing-ship from the past. Clippers brought tea from China

and wool from Australia across the oceans of the world to England. **4** : 205, 207

Clive, Robert, started as a clerk in the East India Company and led the British against the French and Indian forces. He played a great part in establishing India as a part of the British Empire. He lived from 1725 to 1774. **3** : 251–255, *253*

clock, see TIME.

cloisters, a wide roofed passage built outside cathedral or monastery with an outlook upon lawns or gardens for the rest or leisure of the clergy. **5** : 201

clothes, the garments worn to keep men and women warm, and to express their pleasure in dressing up and looking beautiful. They are described for younger readers in **6** : 52–55.

clover, a common wild plant of the countryside. It is also cultivated in meadows to be gathered in with the hay crop. Its flower-heads are long and white or purplish-red in colour. **1** : 218, 329, 336–337, 340, 349, 356

Clyde, a river on the west coast of Scotland famous for its shipbuilding yards. **2** : *148*, 288

coal, the partly decayed tree-trunks from ancient forests compressed through thousands of years in the earth and so changed into a form in which, when dug up, it makes an excellent slow-burning fuel. **1** : 366; **4** : 92–100, *93*, *94*

Coal can be baked to give off COAL-GAS (**4** : 98–100) which we use in gas-stoves, and the "left-overs" from this process give us many useful products like coke, drugs, dyes and tar (**4** : 97).

coalfield, an area containing coal-mines, such as the South Wales coalfield. See COAL-MINING. **2** : 275

coal-gas, the gas extracted from COAL when it is baked in retorts at the gas-works. It is composed largely of hydrogen and methane. **4** : 98–100

coal-mining, the new industries established by the Industrial Revolution required coal as the power to drive their machinery. Improved methods of transport by rail and water enabled coal to be carried to the new towns. **3** : 228, 229, *231*

This new industry led to the development of coal-mines (**4** : 97), which consist of shafts and passages, sometimes far underground, leading to the seams of coal, which miners attack with picks and mechanical coal-cutters.

coarse fish, in Great Britain, freshwater fish other than those of the salmon family, which are called game fish. Coarse fish include bream, carp, chub, gudgeon, perch, roach, rudd and tench. **6** : 250

cobra, a large, deadly poisonous snake of India and Africa. When it rears to strike its prey, a hood-like structure spreads open behind the head. It preys on other snakes. **1** : 130

cock, the male of the domestic fowl, or other birds. **1** : 305

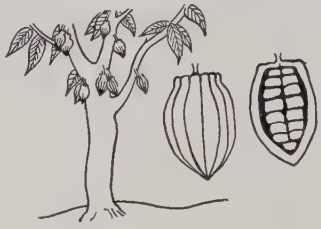
cockchafer, see BEETLE.

cockle, one of the MOLLUSCS which have a double shell and are therefore known as BIVALVES. **1** : 18, 275

cockroach, an INSECT that is related to crickets, grasshoppers, and termites. The so-called "blackbeetle" is the most familiar, but there are many different kinds. **1** : 205, 214

cocksfoot, sometimes called orchard grass, is widely cultivated as a hay and pasture grass. See also GRASSES. **1** : 240

cocoa, a food which comes from the cocoa-tree, or cacao tree, a tropical American tree, whose bean-like seeds are



crushed and powdered to make chocolate and cocoa powder. **1** : 32; **2** : 303–305

coconut, the fruit of the coconut palm, a tall tree which grows in the tropics. The coconut contains a sweet colourless liquid called "milk," and thick white flesh, covered by a hard

hairy shell. It is a universal food in the South Sea islands. The flesh when dried is called copra. **1** : 239; **2** : 255

cocoon, a silken sheath spun by the LARVA of an insect in which it spends the resting period in its life, before it changes into an adult. During this resting stage the creature is known as a pupa. ANTS, BUTTERFLIES, and MOTHS are among the insects the larvae of which spin a cocoon. **1** : 190–193, 199, 213

cod, a large sea fish of northern waters. **1** : 379, 390

coelacanth, a fish supposed to have been extinct for over fifty million years, but which survives today. **1** : 277

coffee, the roasted and crushed seeds of the berry-like coffee berry. This is picked from coffee trees, like tall laurels, which are grown in plantations, especially in Brazil and East Africa. The well-known drink is then brewed from this powder. **1** : 327 ; **2** : 305–308

coke, the solid stuff which remains when the COAL-GAS has been extracted from COAL. It is itself a slow burning fuel

4 : 98–99

Coleridge, Samuel Taylor, a Christ's Hospital schoolboy who became one of the most romantic in spirit of English poets.

5 : 24, 97

His work, especially *The*

Ancient Mariner (**5** : *96*), was influenced by the old ballads, the magic and simplicity of which he captured. He lived from 1772 to 1834.

collectors' hobbies. Nearly everyone likes to make a collection of some sort whether it be a museum of strange objects from distant lands or a specialist's collection such as 17th-century dolls. **5** : 286–383

Such hobbies include STAMP-COLLECTING (**5** : 287–289, *295*), collecting matchbox labels (**5** : 290, *296*), cheese labels (**5** : 291, *297*), postcards (**5** : 292), BRASS RUBBINGS (**5** : 302), sea SHELLS, (**5** : *320*, 322), FOSSILS (**5** : 323), ROCK specimens (**5**: *317*, 325), butterflies (**5** : 312–314, *318–319*).

Colombia, a country of South America. It lies at the northern end of the Andes, and has large oil deposits. The capital is Bogotá. **2** : *165*

Colorado beetle, see BEETLE.

colour, the reflection to our eyes of some light rays after the others have been absorbed by the substance we are looking at. See also WHITE and BLACK.

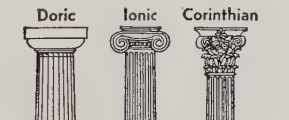
4 : *342*, 343–345

colour-printing, a means of printing pictures in colour. It requires that each sheet be printed several times over, each time with a different coloured ink to give all the colours of the original picture.

4 : *300–302*, 303–304

Columbus, Christopher, an Italian sailor who believed that the earth was round not flat, had the support of the Queen of Spain to lead an expedition westward to try to reach India and instead discovered Cuba and Haiti, islands off the American continent. He lived from 1451 to 1506. **3** : 135, 157–159

columns, the pillars used for supporting the roof of a Greek or Roman building. There are three main types, or orders,



known as Doric, Ionic and Corinthian. **5** : 202–203

combine-harvester, a machine which is driven across a cornfield, cutting and threshing the corn as it goes.

1 : 334–336, 357 ; **2** : 329

comet, a brightly lit body circling round the sun. Comets appear very occasionally and are visible from the earth only for a short time. They may take hundreds of years to come back again. It is thought they consist of solid matter bound together by frozen gas, which partly evaporates when the comet is near the sun, so forming the tail, millions of miles long, which all comets have. The tail is always turned away from the sun. Comets form part of our solar system. **2** : 374

Commons, House of, see PARLIAMENT.

communication, the name given to the various systems, such as TELEPHONE, RADIO, POSTAL SERVICES and TELEGRAPH services, by which people are able to communicate with one another. **2** : 269–274, *277*

Communist, a supporter of the system of government introduced into Russia after the Revolution of 1917. Communist parties exist in many countries, and Communist governments exist in China and in some countries under Russian influence in Eastern Europe. **3** : 352

compass, a simple instrument which makes use of a freely-moving magnetized needle to enable us to find our direction. Held parallel with the ground, in Britain, the needle points slightly to the west of north, from which we can know all the other directions.

4 : *134*, 137, 212–213; **2** : 139

composer, one who makes up music. **5** : 233, 238–251

compressed air, can be made to work for us at need as in paintsprays, train brakes and road drills.

4 : *133*, 365, 366, 368

concerto, a musical composition in several contrasted but closely-connected parts in which one instrument (most often the piano or violin) is accompanied by the whole orchestra. This gives scope for a brilliant exhibition of what the piano or violin, etc. can do when used in this way with the orchestra as background, and at public performances the player is usually a pianist or violinist of renown. BACH, BEETHOVEN, MOZART and BRAHMS have each written several magnificent concertos, and SCHUMANN, GRIEG and RACHMANINOV have each one or more famous piano concertos.

5 : 228–229

concrete, a modern building material made from a mixture of cement, sand and small stones.

4 : 314 ; **5** : 218–219

conduction, the spreading of heat, through a solid object such

as a teapot or a poker. See also RADIATION and CONVECTION.

4 : 32

conductor, the musician who trains and controls an orchestra. He views the needs of the music as a whole; and, by his signals as he beats time, he can increase or diminish the volume of sound from any part of the orchestra or speed up or slow down the rate of playing.

5 : 228, *229*, 231

Composers are not necessarily good conductors. Among the most famous conductors of this century are Arturo Toscanini (5 : 238), Sir Henry Wood and Sir Thomas Beecham.

Confucius, a great philosopher-teacher of China. He believed that man was good and laid down a code of good manners and behaviour, stressing the duties of one class to another and insisting on treating one's ancestors with religious respect. He taught, as most religions do, that we should not do to others what we would not like others to do to us. He lived from 551 to 479 B.C. 6 : *408*

Congo, a vast African river flowing through 2,000 miles of jungle to the Atlantic Ocean.

2 : 16, *19*

conifer, see TREES.

conjunction, a word that links other words together; The cat *and* the fiddle. Blue *and* green *and* scarlet. They can also link whole phrases or sentences: The clown looked funny *and* the child began to laugh. The driver wanted to start *but* the donkey refused. 6 : 155

conjuring, creating baffling illusions by the deft handling of

small objects, while the conjurer distracts the audience with his talk. Cards, coins, watches, handkerchiefs, hats and boxes are his stock in trade, and his commonest trick is to make things vanish from where they were last seen and appear again where they are least expected. Many children like to entertain their friends with tricks and make a hobby of conjuring.

5 : 379–382

Conrad, Joseph, Polish-born writer, wanted to be a sailor, and rose to be a captain in the British Merchant Service, before leaving the sea to write some of the finest sea stories in English literature, such as *Lord Jim* and *The Nigger of the Narcissus*. Conrad was a deep student of character and was particularly interested in human beings as individuals. He lived from 1857 to 1924. 5 : 68

Constable, John, perhaps the greatest English landscape

painter. His fresh and natural appreciations of the countryside make it easy for us to love what he loved, and inspired the painters of France to go out and paint what their eyes could see. See IMPRESSIONISM. He lived from 1776 to 1837.

5 : *123*, 141, 144–145

Constantine, see ANCIENT WORLD.

constellation, a recognizable group of stars of which there are many, named by the ancients after some animal, object or god like the Bull, the Plough or Perseus. The Plough is specially famous since from it we find the Pole Star which gives us our direction (north) at night.

2 : 375–382

constituency, a definite district, defined by law, for which a Member of Parliament is elected. See VOTE. 3 : 372

contemporary painters, modern artists who paint in a style, the chief features of which are a bold use of colour and a wide range of experimental treatment. Dufy, Reeve, Kelly and Nash provide good examples of contemporary art.

5 : *156–157*

continents, the great land masses of the earth, AUSTRALIA, AFRICA, NORTH AMERICA and SOUTH AMERICA, ANTARCTICA (the great land mass over the South Pole), ASIA and EUROPE.

2 : 12, *152–165*

control tower, the directing post of an airfield. The control tower collects all information about the aeroplanes in the air and gives instructions to the pilots as to landing and taking off. 4 : 238–239

convection, the spreading of HEAT by movement of the warmed air or water. See also RADIATION, CONDUCTION. 4 : 32

Cook, Captain James, a naval officer who made three voyages of exploration in the Pacific Ocean, reaching New Zealand and Australia.

3 : *2*, *254*, 255–257, 308

cooking, the art of making nice things to eat, should be studied and practised by boys as well as by girls. Everyone should be able to boil his eggs, fry his bacon and sausages, cook his steak, and make his tea or coffee. 5 : *286*, 345–349

Cooper, James Fenimore, turned novelist after three years in the American navy, and produced many books, the best known of which, *Deerslayer* and *The Last of the Mohicans*, are adventure stories of the days of struggle between "Paleface" and "Redskin." He lived from 1789 to 1851. 5 : 51–52

coot, a WATER BIRD like a large moorhen but with a whitish mark on the forehead.

1 : 102, *105*

Copernicus, see STARS.

copra, the dried "flesh" of the coconut. 2 : 256–257

copse, a small wood, or thicket of small trees and undergrowth. 1 : 258

coracle, a light boat made of skin on a wooden framework, used on Welsh rivers. 4 : 208

coral, a sea-creature related to the sea-anemone. It builds for itself a stony skeleton. Reef-

building corals live in great colonies in tropical seas. It is the accumulation of their stony skeletons which forms the reefs which may fringe the shore or may form atolls, or coral islands,

the latter being seen especially in the Pacific Ocean.

1 : *19*, 161 ; 2 : 79–82, 258

cor anglais, or English horn, a wood-wind instrument of the oboe group, having a double reed inside its mouthpiece.

5 : 227

cork, the outer layer of the bark of a tree called the cork oak. The material is light and tough, and it floats in water.

1 : 253

corm, an underground stem. Its purpose is to store food for the young plant. The CROCUS grows from a corm.

1 : 231, *233*

cormorant, a large black sea bird with a slender hooked beak and a long neck. It is a fish-eater, and in some parts of the world it is trained to catch fish for its owners.

1 : *108*, 110–111, 325

corn, a name given to various kinds of GRASS that bear grain, that we can eat. We call such grasses cereals and they include wheat, oats, barley and rye. There is also maize which is called Indian corn, or just corn, in America. The word is also given to the grain obtained from these cereals.

1 : 210, 329, 334, 336, 338, 347–348, 357 ; 2 : 195

Corn Laws put high taxes on imported wheat so that British farmers and landowners would get a good price for theirs. The result was very dear bread, which hurt the poorest most. The laws were abolished in the 19th century. 3 : 233

Coronation Stone, see EDWARD I.

corpuscles, see BLOOD.

Cotman, John Sell, an English landscape painter who lived from 1782 to 1842. Cotman began as an architectural designer and eventually turned to water-colour to produce some of the most delicate and impressive landscapes in English art. His impression of *Greta Bridge* is very well known. 5 : 145

cotton, a plant grown mainly in wet, subtropical regions, especially in the southern United States of America, Egypt, Russia

and India. The cotton plant is grown from seed each year, and looks like a currant bush.

1 : 327 ; 2 : 32, *37*, 286, *314*, 315–318

The "wool" of the cotton is the white tuft that bursts from every seed pod. This is collected, teased out and turned into cotton thread (4 : 287). The threads are woven into a light, warm cloth on which designs in colour can readily be printed (4 : *289*, 288–291) before it is sent off to be made into frocks and skirts. A useful by-product is cotton-seed oil which, with the crushed seeds, makes oil-cake for feeding cattle.

Count of the Saxon Shore, see ANGLO-SAXONS.

countryside, the land, either in its natural wild state or—more usually—as cultivated by farmers. 6 : 73

countryside code, the unwritten law which relates to keeping farmers' gates closed and the countryside free from litter. 6 : 232

Coverdale, Miles, translator of the first complete Bible published in England. He lived from 1488 to 1568. 5 : 42

cowboy, a mounted cattleman who looks after the grazing herds of beef cattle on a ranch.

2 : *188*, 193–195

Cowper, William, an English poet who wrote of the simple happenings of his quiet life in such a way that they appeared to be of tremendous interest. He was a sad man but had plenty of quiet humour, and could write a rollicking poem like *John Gilpin* on occasion. He lived from 1731 to 1800. 5 : 24, 97, 100

crab, a type of CRUSTACEAN with a short, broad, flattened shell, and short feelers, found in rock-pools on the seashore.

1 : 18, 153–155, *158*

crab-apple, a wild apple tree, usually growing only twenty or thirty feet high. It flowers in May, and the golden-yellow or fiery red fruits which follow are small and very tart. 1 : 239–240

crane-fly, or daddy-long-legs, a common garden INSECT with very long legs. It looks rather like a very large mosquito. Its grubs are called leather-jackets. 1 : 202

Cranmer, Thomas, the Archbishop of Canterbury who directed the REFORMATION, compiled the PRAYER BOOK and was burned at the stake in the reign of Mary I. He lived from 1489 to 1556. 3 : 165

Crécy, a town in France, near which a battle was fought in 1346, resulting in the defeat of the French King Philip VI by Edward III of England and his son, the Black Prince. This was the battle in which the English long bow triumphed over the enemy's crossbow.

3 : *134*, 136–137

cricket, a common house and garden insect closely related to the GRASSHOPPER. It differs from this in the position of its forewings, and its head is rounder. Field crickets and mole-crickets live in burrows in the soil, the latter insect having spade-like forelegs for digging.

1 : 200, 207

cricket, a favourite English game, very popular also in Australia, South Africa, India and the West Indies. It is played between two teams of eleven players. The game is played with wooden bats and a small, hard leather-covered ball with which the bowling team seek to strike the wickets which

the batting team—two at a time —must defend. The teams take it in turn to bat and to bowl, the batsmen resting, except for the pair defending their wickets. When the wicket is struck, the batsman is bowled and another starts his "innings." But when the batsman hits away the ball bowled at the wicket, he can score by running to the other wicket while his companion runs to his—this, however, he must do before the ball is returned by a "fielder," for a quick return of the ball to either wicket before the batsman has gained it may result in his being run out. **6** : 233–239

cricket-ball, the throwing of which is one form of ATHLETICS. **6** : 226

Crimean War, the war between Great Britain, France and Turkey against Russia, fought by the shores of the Black Sea. It was in this war that Florence NIGHTINGALE reorganized the nursing service. The war lasted from 1854 to 1856. **3** : 310–312

crocodile, a REPTILE found only in hot countries like Africa, India and certain Pacific islands.

Crocodiles are amphibious, spending a lot of time in water, but they breathe air throughout their whole lives and so are not AMPHIBIANS like frogs or newts. The young are hatched from hard-shelled eggs. Alligators are very similar in appearance to crocodiles ; they are found only in the rivers of the southern United States and of southern China. They differ from crocodiles in that their teeth are out of sight when the mouth is closed, certain teeth fitting neatly into pits in the upper jaw. Caimans belong to the alligator family and are found only in tropical South America. **1** : 15, *29*, 33, 140–142, 278

crocus, an early-blooming plant, with narrow grass-like leaves, and purplish, white, or yellow funnel-shaped flowers. The crocus grows from a CORM. **1** : 231

Crompton, Samuel, see INDUSTRIAL REVOLUTION.

Cromwell, Oliver, a country gentleman and M.P., who became the outstanding general on

Parliament's side in the CIVIL WAR, raising what came to be called the Model Army which defeated King Charles I and his generals. Then England became a republic for eleven years, Cromwell being titled Lord Protector of the Commonwealth. He lived from 1599 to 1658. **3** : *2*, 123, 212–215

Cromwell, Thomas, Earl of Essex, Henry VIII's chief adviser, helping him to suppress the monasteries. He lived from about 1485 to 1540. **3** : 160, 163

crops, the general name given to plants that are specially grown, or cultivated, to provide food for man and for livestock. They include wheat, oats, barley, potatoes and other vegetables. **1** : 326–329, 333, 335–338, 340, *341*, *344*, 345–352, 354–357

Cross, the Christian symbol, since JESUS was killed on the cross, for what He had to say and do. The Cross is therefore a constant reminder to the Christian of the extent of Christ's love for human beings. **6** : 207

cross-staff, an early navigating instrument used by sailors to find their latitude at sea. **3** : *152*, 154

crow, a fairly large, bold, black bird. Some kind of crow is common in most countries. Crows feed on insects, birds' eggs and small rodents, but they also eat grain, and cause much damage to farmers' crops. **1** : 304–305

Crown Jewels, symbols of office and jewellery belonging to the British monarchy. They are kept in the Tower of London. **2** : 346 ; **3** : 62

cruiser, a type of warship second in size to battleships and less heavily-armed, but faster. **4** : 206–207

Crusades, expeditions organized by European kings and nobles of Christian faith against the Moslem conquerors of the Holy Land, Palestine. The Moslems were of Turkish origin and were called Saracens. They had a great leader called Saladin. In all there were eight warlike expeditions against the Saracens between 1097 and 1270, the English army in the Second Crusade being led by RICHARD I. They were called crusades from the Latin word

for a cross, the crusaders wearing a red cross on their cloaks as they believed that they fought for Christ. **3** : 88–90

crustaceans, animals without backbones but with a hard, limy shell surrounding their soft flesh. They have jointed legs, and every now and then shed their outer skeleton and grow a new one to allow for their increased size. Among them are crabs, lobsters, shrimps and prawns. See also WOODLOUSE. **1** : 18, 153–156, *157–158*, 275

Cumberland, Duke of, the leader of the Government forces which defeated the Jacobite army of Bonnie Prince Charlie. The latter had claimed the

throne of Britain on behalf of his father, who had called himself James III of England and VIII of Scotland. **3** : 225

current, a regular drift of water within the ocean caused partly by the regular winds and partly by the spin of the earth itself. Currents formed mainly by wind blowing the surface of the ocean are called drifts. **2** : 116–118

cuscus, a pouched mammal, found in North Queensland, Australia, and in New Guinea. Its thick woolly fur hides its ears, giving the cuscus an odd appearance. It lives in the trees and keeps a firm grip on its perch with the aid of its long tail, which is naked at the end. See also PHALANGER. **1** : 64

Customs, the organization which examines goods, baggage,

etc., especially at ports and airports, in order to collect taxes levied by the government on certain imports. **4** : 234 ; **2** : 200

cuttlefish, a member of the group of MOLLUSCS, like the octopus, but with ten tentacles which may be twenty or thirty feet long. **1** : 164–165

cycling, in one sense is merely riding a bicycle, but to do this properly you should know the Highway Code. This is in a pamphlet issued by the Ministry of Transport to lay down rules of behaviour by all road users, and give road signs and drivers' signals. You should also understand your bicycle and know how to oil and maintain it in sound condition. **6** : 240–243

cymbals, an instrument consisting of two brass plates which are clashed together or, sometimes, struck with drum-sticks. **5** : 226

cyst, the tough, leathery coat sometimes formed by an amoeba to protect it from drying up. **1** : 225

Czechoslovakia, a country of eastern Europe, rich in agricultural and industrial resources. The capital is Prague. **2** : *152–153*

D

daddy-longlegs, see CRANEFLY.

daffodil, a spring-flowering plant with blade-shaped leaves, and a trumpet-shaped yellow flower. **1** : 231

Daimler, Gottlieb, German inventor and engineer who built a motor-car in 1886. He lived from 1834 to 1900. **4** : 125

dairy cattle, see CATTLE.

daisy, a very common plant which flowers nearly all the year round. The white or pink petals surround a yellow centre. **1** : 235

dam, the device of barring the flow of a river by building an immensely thick wall at a narrow point, thus turning the waters into a great lake. The flow from the dam can then be increased or decreased at will and thus the land can be given most water when the growing things most need it. Famous dams are the Senner and the Aswan on the Nile. Others, like Boulder Dam in the U.S.A., use the stored water to make electricity. **2** : 39 ; **4** : *82*

dance music, music with a well-marked rhythm specially written to be danced to. See MUSIC. **5** : 252–254

dancing, unlike walking or running, is the rhythmic movement of the body in time with the rhythm of music, done for the pleasure of the dancer. Dancing combines the pleasures of exercise, music and companionship with the artistic aim of making one's movements graceful, swift and sure. **5** : 252–254, 281–284

Dancing is older than reading or writing, and in the earliest forms was connected with religious beliefs or social occasions like weddings or victory celebrations. Every country has its folk-dances—vigorous formal dances, like the English Morris dances (**5** : 282 ; **3** : 110) or Scottish Highland Fling (**5** : 283, *285*), which have grown out of the earliest dancing and been handed down through the centuries by simple ordinary people. Another strain of dancing was that which the Court developed and the rich enjoyed (**5** : 253, 265–266). Such dancing grew stately and refined—like the gavotte and minuet, and from that line emerged a new art, the BALLET (**5** : *273, 276*). Yet another refinement of folk dancing leads to the Viennese waltz, lancers and polkas of the Victorian ballroom and thence to the modern dance-hall and the foxtrots, quicksteps, tangos, etc. of the last thirty years (**5** : 284).

dandelion, a common perennial weed, with a yellow flower. Its stems and root contain a milky juice. The leaves are sometimes used in salads. **1** : 218, 350

Danegeld, gold for the Danes paid as a bribe for peace by Ethelred the Redeless and other Saxon kings. **3** : 56

Danelaw, the north-east part of England in which the DANES were allowed to settle by Alfred the Great. **3** : 54–55

Danes, natives of Denmark. In Anglo-Saxon times the Danes (often called Norsemen or Vikings) were pagan invaders of England from Denmark and Norway who, like the Anglo-Saxons at an earlier date, sought first plunder, then land and homes in England. In the 9th century these invaders were defeated, chiefly by King Alfred, the greatest of the Anglo-Saxon kings. But in the 11th century they managed for a time to establish a Danish king and court. See CANUTE. **3** : 52, 56–61, *58* ; **5** : 14–15

Danube, a river of central Europe, rises in the Black Forest and flows 1,700 miles into the Black Sea. **2** : *152*

Darnley, Lord, see MARY QUEEN OF SCOTS.

Darwin, Charles, see EVOLUTION.

dasyure, the native "cat" of Australia, although it is really more like a weasel or skunk. It eats rats, mice and birds. **1** : 65

Daumier, Honoré, French painter of great satiric force. Compassionate to the humble, he painted the powerful and the rich in such a way as to make them look mean and greedy. He lived from 1808 to 1879. **5** : 165

David, see PSALMS.

David, St., spreader of Christianity in Wales and founder of monasteries, he was made patron saint of Wales. He lived in the 6th century. **3** : 38–39

"David Copperfield," see DICKENS.

Davis, John, an English explorer of the North-West Passage and discoverer of the Falkland Islands. He lived from about 1550 to 1605. **3** : *170*, 173–174

Davy, Sir Humphry, chemist and investigator of electricity who is remembered first for his invention of a safety-lamp for use in the mines. He lived from 1778 to 1829. **4** : 148–149

D.D.T., see INSECTICIDE.

dead-nettle, a plant which before it flowers looks very similar to a stinging nettle, although quite unrelated. The purple flowers are large. **1** : 250

Dead Sea, a large salt lake on the borders of ISRAEL and JORDAN. **2** : 40

Debussy, Claude Achille, French composer, who wrote numerous orchestral and pianoforte works. He did not try to write the tuneful vigorous music that many have produced before him but rather to express moods in music, such moods as are suggested by rain or mist or the rippling sea. His music is sensitive and gentle. He lived from 1862 to 1918. **5** : 233, 255–256

deciduous tree, see TREES.

decimals, in arithmetic, an easy and very convenient way of working with numbers involving FRACTIONS. The principle is that $\frac{1}{10}$ is represented as ·1, $\frac{8}{100}$ as ·02, $\frac{34}{1000}$ as ·003; so that a number such as $99\frac{79}{100}$ becomes 99·79. The complications of fractions disappear with decimals. **6** : 137–139

deer, a family of hoofed mammals found in most parts of the world except Australia, and seldom in Africa. In most cases, only the males have antlers; these are solid bony growths that are shed every winter, and new antlers begin to grow soon afterwards. **1** : 23, *42*, 43–45

There are many kinds of deer, but probably the most handsome of the three British species is the red deer. It is found also in Europe and Asia, and is the only deer in Africa, where it lives in the Atlas mountains and is known as the Barbary stag. The red deer of the Scottish Highlands and Exmoor are the largest British animals (**1** : *42*, 44, 45). ANTELOPES belong to a different family. See also ELK, MOOSE, REINDEER, WAPITI.

de Falla, Manuel, a Spanish composer, lived from 1876 to 1946. His best-known compositions are *Nights in the Gardens of Spain*, for piano and orchestra, the music for the ballet *The Three-Cornered Hat* and the *Ritual Fire Dance* from the ballet *Love the Magician*. **5** : 270

Defoe, Daniel, English writer and pamphleteer, could be called one of the creators of the novel, because he wrote down the stories of imaginary people just as though they had been real. Thus his world-famous

Robinson Crusoe tells of a shipwrecked man's successful struggle to live on an uninhabited island, a situation with great possibilities of adventure as every child can understand. (Actually such a fate befell a sailor of whom Defoe had heard.) He lived from 1660 to 1731. **5** : 46–47

Délibes, Clément Philibert Léo, a French composer, best known for his delightful music for the ballets *Coppélia* and *Sylvia*. He lived from 1836 to 1891. **5** : 272, *273*

Delius, Frederick, English composer of German origin, who wrote sweet-sounding orchestral music, tender in spirit, with the flavour of the countryside or the inspiration of nature behind it, for example, *A Song in the High Hills* and *On Hearing the First Cuckoo in Spring*. He lived from 1862 to 1934. **5** : 250

delta, an area at the mouth of some rivers, like the Nile, which has been built up from mud brought down by the water and so blocking the mouth that the river splits into several channels to reach the sea. **2** : 34

demoiselle fly, a kind of small DRAGONFLY, common in Great Britain. **1** : 199

Demosthenes, see GREEKS.

Denmark, a country of north-west Europe, and part of SCANDINAVIA, at the entrance to the Baltic Sea, consists of the Jutland Peninsula and a group of islands to the east. Denmark is noted for its dairy-produce. The capital is Copenhagen. **2** : *152–153*

desert, an area with little vegetation. There are hot sandy deserts such as the SAHARA and the KALAHARI and cold deserts in the Polar regions. **2** : 29–32, *38*

desert plants, see CACTUS, GOURD, SPURGE, TUMBOA.

desmid, one of the minute green plants which make up the family of algae. **1** : 224

destroyer, a small, fast warship of particular use in sinking submarines and guarding convoys of merchant ships. For similar use and even smaller is the frigate. **4** : 206–207

Devil, or Satan, the idea or spirit or power of evil as opposed to good. **6** : 195–196

diabolo, a Chinese game played by spinning a wooden object shaped like an hour-glass on a string tied to two sticks for

handles. The object can be tossed up in the air and caught again. 6 : *254*

Diaghilev, Sergei, a Russian, who in this century created and inspired a great ballet company. So original was his work that he brought about a re-birth of the ballet in western Europe, especially in France and Britain. He lived from 1872 to 1922. 5 : 269

diamond mines, see PRECIOUS STONES.

diaphragm, a large circular movable sheet of muscle that separates the chest from the abdomen. 1 : 366

diary, a day-to-day record of your life. Keeping a diary is an excellent way of practising the writer's craft and making you more observant and thoughtful. 6 : 157–158

diatoms, microscopic single-celled plants that are found in shallow seas, in fresh water and in damp earth. Diatoms are enclosed in flinty skeletons and when the plants die the skeletons fall to the sea-floor. Massed together, they form a deep layer of mud known as diatom ooze. 1 : 225

Diaz, Bartholomeu, a Portuguese, the first man to round the Cape of Good Hope. He died in 1500. 3 : 155

Dickens, Charles, a child from a poor family with but little

education, who became a newspaper reporter and soon afterwards England's greatest novelist, producing a huge picture-gallery of characters, many of whom, like Mr. Micawber in *David Copperfield* and Bill Sykes in *Oliver Twist,* became known to all—even to some who have never read his books. Dickens had the imagination to understand and sympathize with the poor and the weak, and you can easily see yourself as David Copperfield or Oliver Twist and share in their adventures. He lived from 1812 to 1870. 5 : 63–64, 164

dictating machine, an instrument which records your spoken words and plays them back as on a GRAMOPHONE so that they may be typed at convenience. 4 : 374–375

diesel engine, a type of internal combustion engine much used in ships and heavy vehicles. It burns, not petrol, but cruder, heavier oil. 4 : 131–132, *133, 222*

Diesel, Dr. Rudolf, the German inventor of the diesel engine as used in ships and tractors. He lived from 1858–1913. 4 : 131

digestion, the means whereby food that has been eaten is changed into a form in which it can be used in the body. 1 : 362–364

dimetrodon, one of the earliest reptiles that lived millions of years ago. From these early reptiles developed the huge dinosaurs that dominated the scene during the great Age of Reptiles. 1 : *283*

dingo, the wild dog of Australia. Apart from bats and rats, it is the only mammal there without a pouch and was probably introduced by early settlers from Polynesia, a long time before the white settlers. 1 : 66–67

dinosaurs, the name given to a group of huge reptiles that lived on earth many millions of years ago ; amongst them were the brontosaurus and TYRANNOSAURUS. The name comes from a Greek word meaning "terrible lizard." 1 : 278–280, *282–283,* 285, 286

Diocletian, the Roman emperor who killed St. GEORGE. 3 : 29

diprotodon, a large grass-eating pouched mammal that inhabited Australia millions of years ago. 1 : 286

disciple, one who follows the teaching of another. Jesus chose twelve of His followers to preach the gospel. See APOSTLES. 6 : 196

Disney, Walt, the maker of many cartoon films based on drawings that seem to move. He was born in 1901. 4 : 353

divine right of kings, the theory held rigidly by the Stuart kings of Scotland and England that kings were appointed by God to rule as they pleased without regard to the wishes of the people expressed in Parliament. 3 : 187, 211

diving, the art of plunging into the water in various ways while making as little splash as possible. See also SWIMMING. 6 : 293–295, *299*

diving, deep-sea, the way by which men are able to explore the bottom of the sea, raise sunken wrecks, and so on.

The diver is enclosed in a heavily-weighted watertight suit to the helmet of which is attached an airline, down which air is pumped from the vessel above. A diving bell is a container in which several men can work under water. See also UNDERWATER EXPLORATION. 4 : *56,* 57–58

division, see ARITHMETIC.

Dobson, Frank, one of the modern school of British sculptors, born in 1887. The strongly modelled head, *Sarah,* is typical of his work. 5 : 180

dock, a quay at which ships are berthed for loading or unloading cargo and passengers. 4 : 196–201, *200*

A floating dock (4 : 62–63) is a device in which even a heavy ship can be raised out of the water to enable the hull to be repaired or cleaned.

A dry-dock is a dock from which the water can be drained, so enabling the ship to be examined at the bottom (**4** : *200*).

dog, a flesh-eating mammal, of which there are many types, both wild and domesticated.

1 : 306—307

A well-known Canadian or Eskimo sledge-dog is known as the husky (**1** : 308, 320, *323*). Its great strength and thick coat make it useful for pulling heavy loads in cold latitudes. See also DINGO, FOX, WOLF.

dog-fish, see SHARK.

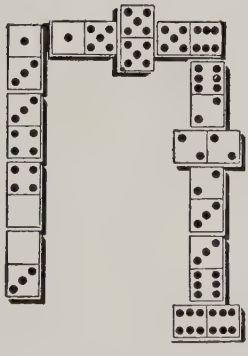
dog-rose, the largest of British wild roses. It is common in hedges and copses and has long arching branches covered with broad hooks. Its flowers are pink, and its scarlet, pitcher-shaped fruits are called hips.

1 : 239

dolphin, see WHALE.

Domesday Book, a written record of the land and property throughout England made on the order of William the Conqueror. **3** : 78–80

dominoes, an indoor game for two or more players, requiring 28 oblong pieces of wood or bone, each piece with two sets



of spots on one side, the spots ranging from 0 to 6. The object of the players, who each get the same number of dominoes, is to match them up with those already laid down, the winner being the first to use up all his dominoes. **6** : 243

Donatello, Donato di Niccolo di Betto Bardi, an Italian sculptor who lived from 1386 to 1466. Donatello was a great admirer of the Greek and Roman masterpieces in stone of earlier days. He was also a close student of nature and of the human body. The result is that his figures are full of life and movement. One of his most famous works is the statue of *General Gattamelata* on horseback. **5** : 170

Donizetti, Gaetano, Italian composer who wrote many operas based on English and Scottish subjects. He lived from 1797 to 1848. **5** : 244

donkey, a domesticated ass, valuable as a beast of burden in many countries. Like the wild ass and the zebra it is a member of the horse family.

1 : 320, *323*

Don Quixote, see CERVANTES.

double bass, a musical instrument and largest member of the string family and the lowest in pitch. It is held by the player standing upright.

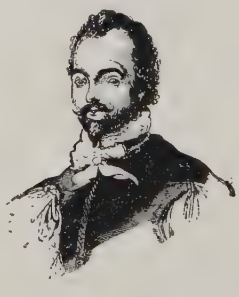
5 : 226

Doyle, Sir Arthur Conan, a British doctor who became a story-teller and created the best-known detective in fiction—Sherlock Holmes. He lived from 1859 to 1930. **5** : 60, 70

dragonfly, a large insect, with a long slender body and two pairs of wings. The first stage of its life is passed as a crawling larva under water. When it is full-grown the larva climbs up a reed into the air, its skin splits and the perfect insect emerges. The dragonfly lives near water and catches small insects for its food.

1 : 195–196, *197*, 199

Drake, Sir Francis, the most famous of Elizabeth's "sea-



dogs" and the first Englishman to sail round the world. He harried the Spaniards, in one onslaught burning 33 ships in Cadiz Harbour; and he was second-in-command of the English fleet when the Spanish Armada sailed to invade England. He lived from 1545 to 1596.

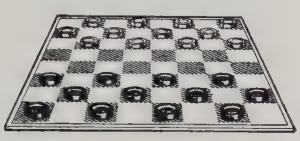
3 : *2*, 166–171, *169*, 186–189

drama, in England, grew out of little plays that were started by the clergy to teach the Bible story. At first they were part of the church service, but gradually they became more like plays or at least like the game called charades. But the clergy, thinking that the plays were becoming the attraction rather than the message they sought to teach, stopped them in connexion with the Church services. But the guilds of craftsmen and shopkeepers, strong in the Middle Ages, decided to keep them going. Each guild made its own wheeled platform called a pageant and was responsible for part of the Bible story. On public holidays the pageants went from point to point where

townspeople had gathered to watch and each gave in turn its part of the story. Other plays began to be made up, plays not about Bible characters but about Goodness and Evil, Pride and Humility, Hatred and Loving-Kindness with Mankind as one who journeys dangerously with the vices for his enemies and the virtues for his friends. Such plays were called morality plays, and after them came early historical plays about real people who had actually lived. Almost as quickly came plays that told the story of imaginary people, by which time Marlowe, SHAKESPEARE and several others were writing. That, then, is the broad rise of the drama from the 14th to the 16th century. Wandering companies of male actors used the inn-yards for

their shows, but soon special buildings were being erected in which plays could be produced. See also GREEK DRAMA.
5 : 75–94, *73*, *83–86*, *95*

draughts, an indoor game for two. It is played on a board



having 64 squares of black and white alternating. Each player has twelve pieces or "men" which he moves about on the black squares, the object being to capture the opponent's men.
6 : 244

drawing, the art of representing objects, scenes or persons usually by making black lines with pen or pencil or brush. Drawing should reveal the structure of what is being drawn and is of fundamental importance to good art-work. 5 : 128–129

dredger, a vessel specially made to scoop up the mud and dirt from the bottoms of harbours and rivers, thus keeping the channels deep enough for the vessels that use them.
4 : 201

drifting, the method used to catch fish that swim near the surface of the sea such as herring. A special ship called a drifter casts out a long net like a giant tennis-net. This drift-net is suspended from floats and weighted at the bottom. It drifts with the tide and herring get caught in it trying to push their way through the mesh.
1 : 183–184

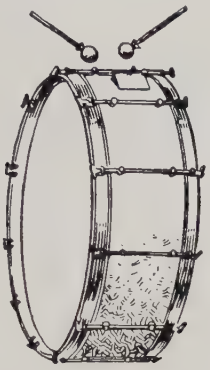
dromedary, see CAMEL.

drone, see BEE.

drop-forge, a machine which beats hot steel into a required shape by dropping a heavy weight on it. 4 : 257

druid, a Celtic priest of the old religion in Britain before Christianity was brought there. The druids practised many magic arts and offered human sacrifices before going to war.
3 : 37

drum, a percussion musical instrument consisting of a hollow rigid frame supporting at each side a stretched skin. When you beat the skin, the drum resounds. Drums do not play tunes, but beat out rhythms. Timpani or kettledrums are of light tone and can be played fast with drumsticks while the big



bass drum is for giving out the loud beat or thunderous roll.
5 : 226

Dukas, Paul, a French composer who lived from 1865 to 1935. His exciting composition *The Sorcerer's Apprentice* is perhaps his best-known work. Unfortunately, Dukas stopped publishing in his early forties, and before he died he burnt more than twenty-five years' work. 5 : 257

Dumas, Alexandre, the most popular of French romancers and author of *The Count of Monte Cristo* and *The Three Musketeers*. He lived from 1803 to 1870. 5 : 59

dungeon, the stone prison below the castle where the owner might keep his captives, often in terrible conditions.
5 : 195

Dutch barn, a structure put up in a field or rickyard where hay and straw can be stored. It is an open-sided shelter, with only a skeleton framework to support the roof. 1 : 133, *342*

E

eagle, one of the group of birds known as BIRDS OF PREY. Like the hawk, the eagle hunts by day. There are many different kinds, but one of the most

famous is the golden eagle, which is found in Europe, Asia, Africa and America. It builds its nest in desolate mountain regions, high up on a rocky ledge or in a tree.
1 : *106*, 115–116

ear, the organ of the body by which we hear. It contains a piece of stretched skin called the ear-drum, and sound waves in the air hit against it, setting up vibrations which travel across a chain of tiny bones to the cochlea, a spiral shell full of fluid that is shaken and from which nerves lead to the brain, carrying messages that the brain interprets as sounds.
1 : 377, 380–382

ear-drum, the piece of stretched skin inside the ear which quivers in response to sound-vibrations and so gives us the sensation of hearing.
1 : 380–381 ; 4 : 370

early forms of life, animals and plants that lived millions of years ago, from which have developed the living things we know on this earth today.
1 : 272–288

earth, the home of mankind. Our world or earth is a slightly flattened ball, about 25,000 miles in circumference, travelling in space. It spins once every day while making a circular journey in which it takes a year to travel around the sun. Three-quarters of the earth's surface is covered with water, broken by great land masses, the CONTINENTS. The core of the earth is probably molten metal at a great temperature while molten patches nearer the earth's crust sometimes break through to form volcanoes. Our earth is one of the planets of the sun,

and has itself a satellite or moon. **2** : 11–15, *367–368*, 372–375

earwig, an insect related to crickets and grasshoppers, but distinguished by its tail pincers. It eats other insects and plants. **1** : 200

echidna, a five-toed spiny ant-eater of Australia. It belongs to the group of pouch-bearing mammals, but lays eggs instead of having living young. **1** : 67–70

echo, the return to your ear of a sound that is reflected back by some obstruction, such as a hill or wall. **4** : 372–373

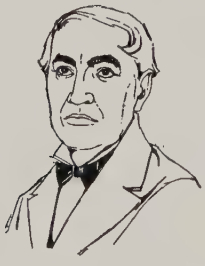
echo-sounder, an instrument which measures the distance of the sea bottom, etc. by the time an ECHO takes to return from it. See also SOUND. **4** : 373 ; **1** : 183

eclipse, occurs of the moon when the earth's shadow falls upon it. An eclipse of the sun occurs when the moon passes directly between earth and sun, so shutting off the sun's light to the earth. **2** : 361–362, *367*

Ecuador, a South American republic lying across the equator. Its chief exports are petroleum, minerals and fruit. The capital is Quito. **2** : *165*

Edinburgh, the capital city of Scotland, famous for its annual festival of Music and Drama, the beauty of its main thoroughfare, Princes Street, its castle and the royal palace of Holyroodhouse. The population is half a million. **2** : 88

Edison, Thomas, an American inventor whose work led



to many notable scientific advances. He invented the phonograph, the earliest form of gramophone; he helped to make the telephone a practical form of communication and he perfected the electric lamp. To light such lamps he built a powerful electricity generator. He lived from 1847 to 1931. **4** : *151*, 153

Edmund, St., a Christian king of East Anglia in Anglo-Saxon times. He was captured and martyred by the Danes. **3** : 52

education, means a leading out of ignorance into knowledge, and in Britain as elsewhere men's ideas of how the young generation should be taught have changed greatly through the ages. **3** : 292–297

You can compare in turn the views of the Middle Ages (**3** : 292–293) with those of Elizabethan times (**3** : 294) ; the Georgian period (**3** : 280–281, 294–295) with the Victorian age (**3** : 295–296), and the past with the present (**3** : 297).

Edward the Confessor, crowned King of England in 1042, was more like a monk than a king and too favourable to the Normans to please his nobles. He reigned from 1042 to 1066. **3** : 61–64, 342

Edward I, the "Hammer of the Scots," annexed Wales, and temporarily vanquished the Scots, carrying off the Stone of Scone on which their kings were crowned. It is now known as the Coronation Stone. He reigned from 1272 to 1307. **3** : *116*, 117–118, 127–128, 343

Edward II, first Prince of Wales, had no sooner become king than he lost Scotland to Bruce at Bannockburn. He was deposed and murdered. He reigned from 1307 to 1327. **3** : *116*, 128, 343

Edward III, defeated the French at the Battle of Crécy. During his reign occurred the Black Death. He reigned from 1327 to 1377. **3** : 135–136, 145, 343

Edward IV, son of Richard Duke of York, defeated the Lancastrian king, Henry VI, in the Wars of the ROSES, and himself ruled peacefully for some years. He reigned from 1461 to 1483. **3** : 150, 342

Edward V, was only a child when his father died and his uncle, Richard, became Regent. To gain the throne for himself Richard had Edward and his

younger brother imprisoned and murdered in the Tower of London. Edward reigned in 1483. **3** : 150, *151*, 342

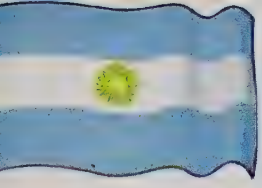
Edward VI became king at the age of nine, and was advised by a Council of Nobles who maintained the Protestantism of his father Henry VIII. He reigned from 1547 to 1553. **3** : 165, 197, 342

Edward VII, the king after whom the Edwardian age, preceding the First World War, is named. He reigned from 1901 to 1910. **3** : 346

Edward VIII, King of England, abdicated the throne in 1936 soon after his accession, in order to be free to marry as he wished. He became Duke of Windsor. **3** : 343

eel, a fish that travels to the seas off the West Indies to spawn. When the eggs hatch the young are flat and leaf-like in shape. They make their way back to the rivers and ponds of Europe, whence their parents came, taking two or three years on the journey. They are growing all the time, and when they

reach the mouths of the rivers, they change in colour and shape and become more eel-like. They

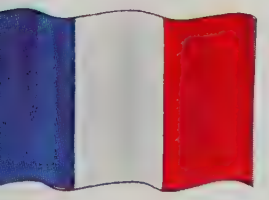


Argentine

Belgium

Brazil

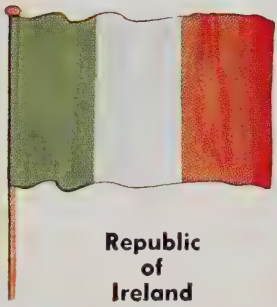
China



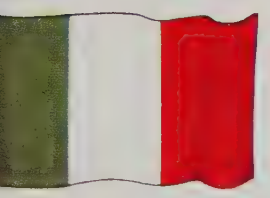
France

Great Britain

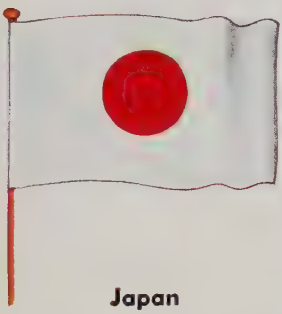
Greece



Republic of Ireland



Italy



Japan

Mexico

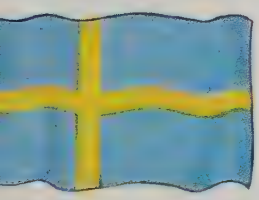
Netherlands

Norway

Poland

Russia or Soviet Union (U.S.S.R.)

Spain



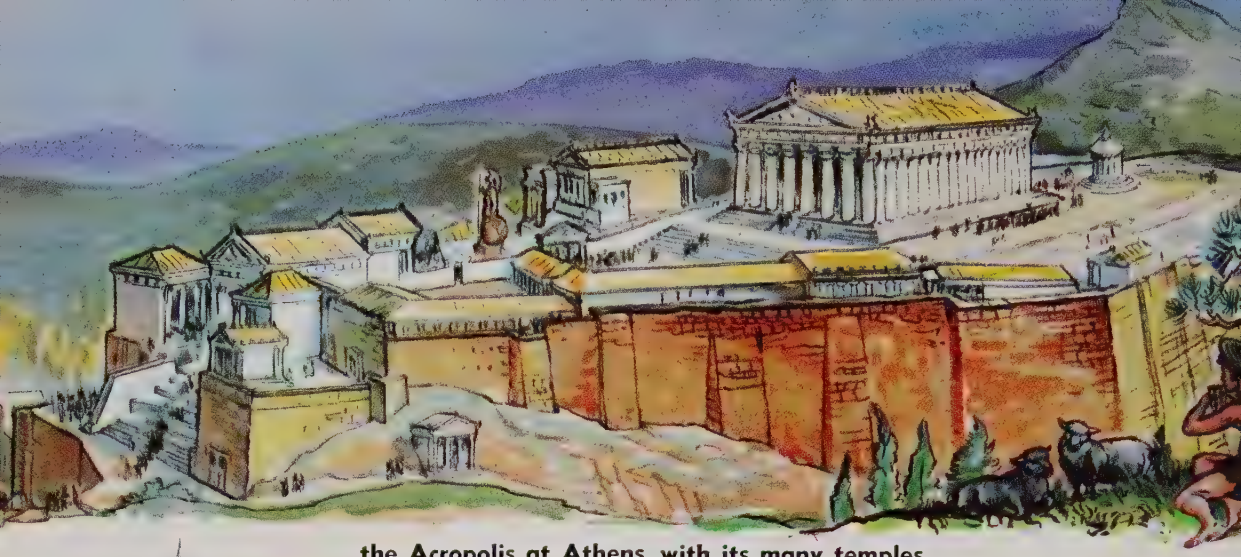
Sweden

Switzerland

Turkey

United States

EACH NATION HAS ITS OWN FLAG—HERE ARE SOME OF THEM



the Acropolis at Athens, with its many temples

warriors

pottery

musicians

gathering and pressing grapes to make wine

THE ANCIENT GREEKS WERE HIGHLY CIVILIZED PEOPLE

are then known as elvers. This is the first stage of the change of form known as METAMORPHOSIS. 1 : 180–182

The electric eel, in spite of its name, is not an eel, but is closely related to a group of fish called characins. It can give off a powerful electric shock when touched.

egg, the female cell from which a new animal or plant will develop if the egg is fertilized. See FERTILIZATION. 1 : 348

Birds' eggs (1 : *95*) are usually laid in beds or shelters called nests. Here the eggs hatch and the young birds emerge to spend there the first part of their lives.

egg-eating snake, a long thin snake with a head the size of the point of a finger. Yet it can swallow a hen's egg whole, because it is able to stretch its mouth very wide. 1 : 129

Egypt, the country in North Africa whose capital is Cairo and whose livelihood depends on the river NILE. The SUEZ CANAL passes through Egyptian territory. Egypt is officially known as the United Arab Republic. 2 : 33, *37*, *154–155*

Egyptian painting, see PAINTING.

Egyptians, Ancient, built their civilization on the fertile banks of the River Nile, beyond which lay desert wastes. They invented picture-writing and paper made out of papyrus reeds to write upon. They worshipped animal-headed gods and held many animals to be sacred. They preserved as mummies the bodies of their kings and built vast pyramids at enormous cost in human life and energy as tombs for the Pharaohs.

As well as building pyramids for their dead kings, the Egyptians built also magnificent temples to their gods, and great monuments of granite on which were carved inscriptions in hieroglyphics, or picture-writing. From one of these temples came two great pillars known to us as Cleopatra's Needles. They were set up at the entrance to the Temple of the Sun at Heliopolis about 1500 B.C. One now stands on the Thames Embankment in London, and the other is in New York. 6 : *318*

eland, the largest antelope in Africa. 1 : *30*, 35

electric battery, see BATTERY.

electric circuit. Every source of electricity or storage battery has two poles called positive and negative; and the invisible power is always ready to rush from one pole to the other. To make it work, however, it must be "piped," or rather wired, from the positive pole to the work it has to do, before allowing what is left over to return to the negative pole. This is why you need at least two wires in electric cable, one to conduct the current to the lamp or motor, another to complete the circuit back to the negative pole. The current will not flow till the circuit is complete. 4 : 146–147, 161

electricity, a strange, invisible natural force. 4 : *82–83*, 144–*152*

It can be made to work for us by lighting lamps (4 : 147), ringing bells (4 : 161), driving electric motors (4 : 150–157) and so on. Every city has great GENERATORS or dynamos housed in POWER-STATIONS (4 : *82–83*, *152*, 162; 6 : 407) for making the electricity to light and heat our homes. See also ELECTRIC CIRCUIT. Electricity is connected with magnetism (see MAGNET), and indeed magnets can be made with the help of an electric current (see ELECTRO-MAGNET).

electric light, comes from an electric current heating a

piece of wire to white-heat inside a glass bulb. 4 : 147

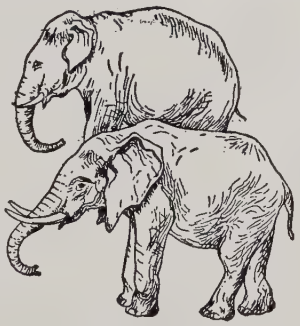
electric motor, a motor using ELECTRICITY to drive it. Compare with GENERATOR. 4 : 150–154

electric switch. Every electric circuit needs a device for stopping the flow of electricity just as a tap stops or starts the flow of water in your pipes. This device is called a switch, which simply breaks or joins at will the wire along which the electricity is flowing. 4 : 147

electro-magnet, a magnet made by a current of electricity being passed through a wire coiled around a core of iron. It is used in many electrical inventions including the generator or dynamo, the bell and the telephone. 4 : 149, 161

electro-plating, the use of electricity to coat articles made of a metal such as copper with a film of a metal such as silver. 4 : 155–158, 259

elephant, the largest of the world's land mammals and relative of the extinct mammoth. It has a very thick skin, a long tapering trunk, the end of which can be used to pick up objects, and two heavy tusks. The



African elephant is larger than the Asiatic or Indian elephant. Indian elephants are tamed and used as domestic beasts to pull and carry. 1 : 26–27, *31*, 320; 2 : 26

Elgar, Sir Edward William, the greatest English composer of the early 20th century. He wrote many orchestral compositions of which the *Enigma Variations* are the most famous, two symphonies, a violin concerto, chamber music and the famous *Pomp and Circumstance* marches, one of which contains the tune of *Land of Hope and Glory*. He lived from 1857 to 1934. 5 : 250

El Greco, born in Crete, gained his world fame by painting in Spain about the time of

the Armada. His religious pictures are surprisingly modern in spirit. He lived from about 1542 to 1614. **5** : 131–132

Elizabeth, wife of Zacharias and mother of John the Baptist. **6** : 191

Elizabeth I, perhaps the most famous of English monarchs. Her reign was glorious

for its literature, its men of action—especially seamen and explorers—and the defeat of the Spanish Armada. It was a period of success at home and abroad. She reigned from 1558 to 1603. **3** : *2*, *169*, 175–178, 189–193, *191*, 197, 342

Elizabeth II, Queen of Great Britain, came to the throne in 1952. In 1947 she married His Royal Highness the Duke of Edinburgh, formerly Prince Philip of Greece. Their son, Prince Charles, Prince of Wales, is heir to the throne. He was born in 1948, his sister, Princess Anne, in 1950, and his younger brother, Prince Andrew, in 1960. **3** : *343*, *368*

elk, a form of deer, known in Europe as the elk and represented in North America by the MOOSE. Another kind of American deer, the wapiti, is often called the elk. **1** : 23

elm, a tall tree that gives ample shade with its spreading branches, and broad, rather flat top. Its wood is very hard, and often used for garden furniture. **1** : 235, 254, *255*, 257

elver, see EEL.

emu, a large flightless bird of Australia. **1** : *118*, 123–124

enclosures, improved ways of farming which were introduced in the 18th century, and consisted of enclosing the open fields with hedges and introducing a rotation of root and grass crops with corn. As a result the herds of sheep and cattle were greatly improved, and the land made more fertile, but many small peasant owners were forced to become land-less labourers, while the great landowners became extremely rich. **3** : 260–267, *264–265*

energy, natural vigour or strength, of a person, the power which causes action or motion. **1** : 362–368, 383

England, the largest of the countries comprising the UNITED KINGDOM, although primarily a manufacturing country has substantial agricultural, mining and maritime resources. The population is 40 million. Its chief towns are London, the capital, Manchester, Birmingham, Liverpool, Leeds, Sheffield ; its chief rivers, the Thames, Humber, Tyne and Severn. **2** : *148–149*

The name England (**3** : 35) comes from Angleland, the name of the most powerful kingdom of the Anglo-Saxons in England.

English, the language that has developed from the dialects brought to Britain by the invading Anglo-Saxons in the 5th century. It is now one of the most used languages in the world, being spoken throughout the British Commonwealth and United States and taught by many nations in their schools. **5** : 15–21 ; **6** : 144–160

eohippus, the earliest known horse-like animal. It was no bigger than a dog. **1** : 287

Epstein, Jacob, born in America of Russo-Polish parents, came to London in 1904 and has since sculptured many of the most famous people of our century. A great sculptor, his work has often caused controversy, especially his figures commissioned for the decoration of buildings. He was born in 1880 and died in 1960. **5** : 177

equator, the imaginary line on the earth's circumference midway between the North and South Poles. As the earth spins, the sun is always directly above this region, so it has no change of season or climate, being extremely hot all the year round. **2** : 12, 17–18

erosion, the wearing away of land due mainly to the action of water in various forms, and to wind, frost and ice. See also GLACIER. **2** : 70–71

Eskimos, a yellow-skinned people who live nearer the North Pole than any other race. They are found in northern Canada and Greenland, hunting seals for their clothing and catch-

ing fish for food. They use a canoe called a kayak. **1** : 308 ; **2** : 61–64

esparto grass, a kind of grass that grows in Spain and North Africa ; it attains a height of 3 or 4 feet and has large

leaves. It is used for making ropes and paper. **4** : 291 ; **1** : 241

essay-writing, a convenient form of exercise in writing, the essay being a short piece of writing in which one's personal feelings and thoughts can be expressed in an entertaining, even amusing, way on almost any subject that is of interest to human beings. Good advice on essay-writing is found in the pages mentioned and worth remembering. **6** : 159–160

Ethelred, the 9th-century King of Wessex, who waged war successfully against the

Danes, preceding King Alfred. He reigned from 866 to 871.
3 : 53

Ethelred the Redeless, an English king who preferred to bribe the Danes than to fight them. He reigned from 978 to 1016. 3 : 53

eucalyptus, a quick-growing tree of Western Australia and Tasmania. It provides gum, eucalyptus oil and timber.
1 : 218 ; 2 : 261

Euclid, see GREEKS.

Europe, a continent in the Northern Hemisphere. The sea forms its boundaries to the north, west and south and the Ural Mountains to the east. Its climate varies from the warm southern countries of the MEDITERRANEAN regions to the cold sparsely populated lands in the north. It contains the greatest concentrations of people and industries.
2 : *152–153, 156–157*

evaporation, the heating of a liquid so that its particles start to fly off, that is, it turns to a gas. The sun's rays can make water evaporate, but a quicker way is to boil it. 4 : 52–54

Everest, Mount, the highest mountain (29,028 ft.) in the world. It is in the HIMALAYAS.
2 : 239, *242* ; 1 : 368

evergreen, a TREE or SHRUB that is green throughout the year. Holly is a good example.
1 : *256*, 257–259

evolution, the name given to the development of living things, during which changes in form occur. See EARLY FORMS OF LIFE.
1 : 273–276

Many animals that lived millions of years ago have died out, but others developed in different ways, adapting themselves to the changing conditions of their surroundings, and their descendants live today. The idea that all forms of life were related and that even man had developed from simpler creatures is called the Theory of Evolution. A famous British scientist, Charles Darwin, wrote a book about it called *The Origin of the Species by Natural Selection.* He lived from 1809 to 1882.

ewe, a female sheep.
1 : 338–340

Excalibur, the magical sword which King ARTHUR acquired by supernatural means and which was returned whence it came after his death. The story is told by Tennyson in his *Idylls of the King.* 5 : 33–35, 37

expansion of metals, occurs when they are heated.
4 : *38*, 39–40

Eyck, Jan and Hubert van, Flemish brothers who were among the first artists to use OIL PAINTING. Jan lived from about 1385 to 1440 and Hubert from about 1366 to 1426.
5 : 121–122, 134, 139

eye, the organ of sight. It consists of a lens which receives and focuses light rays on a number of light-sensitive cells at the back of the eye, called the retina. The light forms an upside-down image on the retina, and a message travels along a nerve to the brain. The brain understands what is in front of the eye and makes you see things the right way up. To protect the retina from too much light, an opening over the lens of the eye, called the pupil, is controlled by muscles of the iris, which make the pupil close up in bright light. If the light is poor, the pupil opens wider.
1 : 377, 380–383

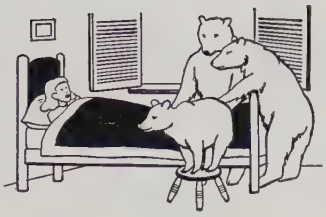
F

fable, see AESOP.

factors, numbers which divide into another number exactly ; thus 3 and 7 are factors of 21. 6 : 125–127

fair, in the Middle Ages and even sometimes today a great market for the display and sale of the goods for which the county, the district, or the city is renowned. More often today it is simply a travelling collection of booths with competitions, entertainments and things to sell. 3 : 92–93 ; 6 : 99

fairy-tale, a tale for children in which imaginary creatures such as fairies, elves, witches and wizards, as well as human beings, usually play a part, causing magical things to happen. Animals also figure, as in the story of Goldilocks and the Three Bears. Hans Andersen and the brothers Grimm are the best-loved tellers of fairy-tales. See also FOLK-TALE. 5 : 25–30



falcon, a BIRD OF PREY that hunts in the daytime. Falcons differ from hawks in having long, pointed wings and short tails. 1 : *106–107*, 115–116

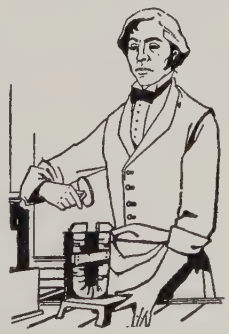
The peregrine falcon (1 : *107*, 116) is probably the best-known, the kestrel (1 : *107*, 114–115) can hover in the same spot in mid-air for some time, the merlin (1 : *106*, 114, 116) builds its nest on the ground.

family, the group of father, mother and children in which all men and the higher animals naturally live. 3 : 8–9 ; 6 : 49

fan, electric, a device for stirring the air, often placed so that it will extract bad air or even dust (as when used in a vacuum cleaner) but sometimes used purely as a cooling device.
4 : 364, 156

F.A.O., the abbreviation for the Food and Agricultural Organization, a branch of the UNITED NATIONS ORGANIZATION. 3 : 359

Faraday, Michael, son of a blacksmith, became a Professor



of Chemistry, and made great discoveries about electricity and

magnetism. He lived from 1791 to 1867. **4** : 47, 147–150, *151*

farm, the land, together with the necessary barns and buildings, on which animals are reared for eating or milking, and crops are grown for food. **1** : 313–315, 319, 326–360, *341–344* ; **6** : 92, 94, *95*

Among farming pioneers (**3** : 261–262) are Lord Townshend, who invented a form of ROTATION OF CROPS, Jethro Tull who invented a seed drill and horse hoe, Coke of Holkham, and Robert Bakewell who bred better sheep. Great advances in farming were made in 18th-century England.

farm implements, the tools and machines used on a farm so that work can be done more easily and quickly than it would be otherwise. There are many kinds for different purposes. For example, ploughs and harrows are used to prepare the ground so that seed can be sown, and combine-harvesters are valuable when it is time to reap the harvest. **1** : 333–336, *341*, *342–344*, 346, 347, 350–352, 354, 356

Fascist, a supporter of the system of government introduced into Italy by Mussolini. **3** : 352

Fawkes, Guy, soldier and Catholic convert, conspired with Robert Catesby, Percy and other Catholics to blow up King and Parliament on 5th November 1605 in revenge for King James's severe laws against Catholics. The conspirators were caught and executed. He lived from 1570 to 1606. Guys are

still paraded and burnt on 5th November to commemorate the defeat of this plot, known as the Gunpowder Plot. **3** : 200–202

feeding-tray, a means of feeding the birds if you have no garden and cannot set up a bird-table. **1** : 79

feeling, the sense by which we can tell the difference between hot and cold, hard and soft, etc. See NERVOUS SYSTEM, REFLEX ACTION, SENSES. **1** : 379

fern, a plant that has root, stem and leaves, but does not

bear flowers. It reproduces by means of SPORES instead of seed. Its shape may be outlined for record purposes by SPATTER-WORK. **1** : 259–262 ; **5** : 311

ferret, a domesticated form of the polecat, related to the weasel. Tame ferrets are used for hunting rats and rabbits. **1** : 325

fertilization, in plants, the union of the male cells or POLLEN, with the female cells, or OVULES, from which a new SEED develops. In animals, the male cell is called a sperm, and the female cell is called an ovum. See also POLLINATION, REPRODUCTION. **1** : 231

fertilizer, see MANURE.

field cricket, see CRICKET.

field-glasses, a sort of linked pair of TELESCOPES but using prisms as well as LENSES, which make them more compact. **4** : 333

Fielding, Henry, one of the very best of English novelists. He wrote *Tom Jones*, *Joseph Andrews* and *Amelia*, realistic and humorous pictures of 18th-century life. He was also a judge and lived from 1707 to 1754. **3** : 239

field vole, or short-tailed field mouse, a rodent that lives on seeds, nuts and, especially, grass in hedgerows and fields. **1** : 37, 304

Fiji Islands, a British colony consisting of a group of over two hundred islands in the South Pacific and inhabited by dark-skinned Fijians and Hindu Indians. **2** : 258

filament, see STAMEN.

film, a series of thousands of photographs taken in quick succession on a single strip of continuous film. When these are projected on to a screen by a film PROJECTOR, they replace one another so quickly that the eye cannot notice the slight gap between each and sees only people and objects moving naturally as in life. **4** : 349–353, *351–352*

The cartoon type of motion picture popularized by Walt DISNEY (**4** : *352*, 353) is based on the FLICKER BOOK (**4** : 349).

Colour films (**4** : *352*, 353–354) require the taking of pictures which sift out the reds, blues and yellows of a scene into separate films. The three films can later be printed on to a single strip. See also COLOUR-PRINTING.

film strip, a series of still pictures on a strip of film for a MAGIC LANTERN type of projector. **4** : 350

fiord, the Norwegian word for a long narrow inlet or arm of the sea, a common feature of the Norwegian coast. **2** : 53

fire, a chemical change in which wood or coal, etc. turns to ashes while giving off flame, heat and light. **4** : 18–21

Early ways of making fire were through friction (**4** : *19*),

including the rubbing of one piece of wood on another, perhaps by means of a bow drill.

fire-extinguisher, a container, usually filled with water which can be forced out by a gas made from the mixing of two chemicals. **4** : 367

Other extinguishers contain a liquid chemical which evaporates into a non-inflammable gas when pumped on to the fire, smothering the flames.

fire-fish, a tropical fish, belonging to the family of poisonous scorpion fish, which have very long spines on the fins.
1 : *175*, 174

fireworks, devices for our entertainment made to burn with brilliant and colourful effect, often using the rocket principle. Some of them simply explode with noisy bangs.
4 : *121*

fish, the oldest class of animals with backbones (from which the others are descended). They are cold-blooded and live in fresh or salt water, breathing the oxygen dissolved in the water. They swim by sideways movements of the tail, many being of "streamlined" torpedo shape. They are covered with overlapping scales. Most fish lay a great many eggs, many of which get eaten by other fish and of those that hatch only a few young fish grow to maturity, so great is the competition for food in the sea.
1 : 16, *157–158*, 159, 166–174, *175–176*, 177–184, *185*, 276–277

fishing, either sea fishing or freshwater fishing. Both kinds need fishing-tackle, which usually means rod, line, reel to hold the line, and length of gut or nylon to which the baited hook or imitation fly is attached. There is much difference between the rods, hooks and baits used for catching different kinds of fish, and you must have a clear idea of what you want to catch before you buy your equipment. See also COARSE FISHING. 6 : 248–251

fishing industry, in Britain, carried on mainly from Hull, Grimsby and Aberdeen, with Yarmouth and Lowestoft important for herring. Trawling and drifting are the two main ways of catching fish. Fish is one of Britain's chief exports.
2 : 292–297

flags, pieces of coloured cloth, each bearing a pattern or symbol recognizable to all as standing for a particular country, steamship line, etc. Flags are fixed to cords and run up to the top of masts, whence they unfold in the breeze. Some flags may only be used by the holders of certain offices, such as the Royal Standard, which is the personal flag of the British monarch. See also UNION JACK.
3 : *263*, *367* ; 6 : *335*

International code flags (4 : *210*, 211) enable ships to signal messages to one another.

Flagstad, Kirsten, Norwegian soprano, born in 1895. She came of a musical family, her father being a conductor and her mother a pianist. 5 : 254

flamingo, a handsome bird of scarlet plumage, slender swan-like neck and long thin legs. Flamingoes live together in large flocks on the shores of tropical marshes and lakes.
1 : 122

flatworm, see WORMS.

flax, the plant from the fibres

of which linen is made. 4 : 282

flea, a wingless bloodsucking insect that can jump great distances for its size. 1 : 200

flea beetle, see BEETLE.

fleece, the coat of wool that covers a sheep. 1 : 352

Fleming, Sir Alexander, the scientist who discovered that a mould which is harmless to man will poison some of the harmful germs which sometimes infect us. A preparation called penicillin made from this mould has been one of the wonders of our century in curing infections and so saving lives. Fleming lived from 1881 to 1955. 3 : 380

flesh, the muscles, or the soft parts of an animal's body between the bones and the skin. It is the name we use for the soft outer covering of the human body. 1 : 364

flesh-eating animals, see CARNIVORES.

flicker book, a series of drawings which appear to move as you flick over the pages of the book containing them. 4 : 349

flies, animals without backbones, belonging to the group of insects. They differ from all other flying insects in having only one pair of wings. Common types of fly are the housefly,

gnat, mosquito and the bluebottle.
1 : 200, 201, 202, 203, 221, 222

flight pioneers, early aviators, notably the Montgolfier brothers and de Rozier in balloons ; Lilienthal in gliders ; and the Wright brothers in a motor-driven machine. Blériot was the first to fly over the English Channel ; Alcock and Brown to fly the Atlantic ; Lindbergh to fly the Atlantic by himself ; and Kingsford Smith to fly the Pacific.
4 : 230–233, *231*

floodlighting, the placing of lamps or small searchlights so as to bathe the outside of a building, or flood an area, with light during the hours of darkness.
4 : 307–308

flower, that part of a plant where are formed the SEEDS from which new plants will grow. The female parts are made up of the STIGMA, STYLE and OVARY and are together known as the pistil. The male parts are the STAMENS. Insects may be attracted to the flower by its brightly coloured petals or by its scent. See also FERTILIZATION, POLLINATION, FLOWERS.
1 : 231, *233*

flower-piece, a painting of an arrangement of flowers. It is a form of STILL LIFE. See the illustrated example by the Dutch artist van Huysum. 5 : *135*

flowers, small flowering plants. They grow wild about the countryside, each kind appearing at a set season of the year. Some flowers are cultivated in the garden, particularly those with well-shaped, colourful FLOWER heads.
1 : 227, 231–232, 235, 237, 239–251, *243–246*

fluke, one of the two blades of a whale's tail that stick out sideways. 1 : 55, 285

fluorescent tube, a glass tube coated with a special paint which glows with a bright light when an electric current is passed through the mercury vapour inside. **4** : 307, 309

flute, a very clear-toned, treble instrument of the wood-wind group. It is a thin cylinder in shape and to sound it, you blow over an opening in the side near one end. **5** : 227

fly, see FLIES.

flying-boat, a type of aeroplane having its body shaped like the hull of a ship. Like the SEA-PLANE it uses the water to come down on as other aeroplanes use dry land. **4** : 240

flying dragon, see LIZARDS.

flying-fish, fish about as big as herring, with fins so large that they act as wings on which the fish glide when they leap from the sea, remaining in the air for a few seconds. **1** : 174

flying phalanger, an Australian pouched MAMMAL belonging to the group of PHALANGERS. They are often wrongly called flying squirrels, which are a different group of animals living in Europe, Asia and North America. **1** : 63–64

flywheel, a heavy wheel revolving with the power shaft of an engine. Once in motion it helps to make the engine run smoothly. See INERTIA.

4 : 30, 127–128

folk dancing, sturdy dances invented by the common people of every nation to give expression to their feelings on occasions worth celebrating. See DANCING.

5 : *274–275*, 281–284, *285*

folk-tale, a story of unknown authorship long handed down by word of mouth. Many FAIRY-TALES began as folk-tales and were later written down, to become children's favourites. See also MYTHS AND LEGENDS.

5 : 25, 33

food, things we eat and drink in order to give ourselves energy to move about, power to resist illness and materials for a growing body. Food values are measured in CALORIES.

1 : 361–365 ; **6** : 56–63, *59–60*

football, see ASSOCIATION FOOTBALL and RUGBY FOOTBALL.

fossil, the preservation in rock of the shape or pattern, or even actual remains, of a plant or animal that existed millions

of years ago. Such fossils include the ammonites and belemnites that were among the earliest form of MOLLUSC. The rocks then were still soft sediment, and hardened later.

1 : 262, 272, 274–275 ; **2** : 101–103 ; **5** : 323–324

fountain-pen, a pen which carries its own store of ink in a rubber bag inside. **4** : 363–364

fox, an animal found in many regions from the tropics to the Arctic. It preys on rabbits, mice and birds, and sometimes raids hen-roosts. It belongs to the dog family and is about the size of a dog. It has a pointed muzzle, and a bushy tail or brush. **1** : 45–46

Fox, George, see QUAKERS.

foxtail, a kind of GRASS with a head which looks like a fox's tail. **1** : 240

fractions, numbers which represent portions of a whole. Thus $\frac{1}{2}$ stands for a half of anything ; $\frac{1}{3}$ for a third ; $\frac{3}{4}$ for three quarters, and so on. Fractions can be added, subtracted, multiplied and divided. **6** : 127–132

Fragonard, Jean Honoré, a French painter who lived from 1732 to 1806. He devoted most of his best years to painting romantic scenes to decorate the rooms of the French aristocracy. **5** : 235

France, the country in Europe which lies south of the English Channel, famous for its foods and wines, its arts and its sciences. The capital is Paris, on the Seine, centre of its motor industry, while Lyons makes world-famous silks and Marseilles is the great Mediterranean port. France, especially its Mediterranean resorts, is a magnet for holiday makers.

2 : *152–153*, 200–207

Franklin, Sir John, an English explorer who discovered the North-West Passage from the Atlantic to the Pacific in 1845, but perished during the search.

3 : *170*, 174–175, 338

Franks, see ROMANS.

Frederick the Great, see GERMANY.

French horn, a mellow-sounding, brass, wind instru-

ment consisting of a long tapering tube coiled in a circle and ending in a wide cone.

5 : 226–227

French Revolution, the rising of the poor peasants, workers and the middle classes in France against their king, Louis

XVI, and nobles in 1789. It started with an attack on the Bastille, an ancient prison-fortress in the heart of Paris, and a republic was set up. The influence of the French Revolution spread throughout Europe, leading to the abolition of kings and the power of the aristocracy in many countries. **3** : 270–271

French words in English, see NORMANS.

fresco, type of picture painted on the new, still-wet plaster of a wall, the colours drying as the plaster dries and hardens.

5 : 131

fretwork, the hobby of making light wooden articles from plywood or other thin material by means of a fretsaw. **5** : 342

friar, a man who took vows like a MONK but who wandered through the world like a beggar instead of living in a monastery. **3** : 113

friction, the force which tends to stop the movement of two things rubbing together, such as a motor tyre and the road. In all machinery, power is being wasted through friction, and we oil the parts that rub together, like the hub of the wheel and its axle, to reduce this waste of power. **4** : 17, 25, 28–29

Friesian, a heavy breed of black and white dairy CATTLE. **1** : 359

frieze, a long strip of SCULPTURE sometimes telling a story and used as decoration along the upper part of the wall of a building. **5** : 172

frigate, see DESTROYER.

Frobisher, Sir Martin, an Elizabethan sailor who made three attempts to discover the North-West Passage. He lived from about 1539 to 1594. **3** : *170*, 173

frog, a small AMPHIBIAN which feeds on insects and worms while living in marshes and ponds. Its eggs, laid in the water, hatch into legless tadpoles which breathe by means of gills. They swim about in the water while slowly growing legs and lungs and losing their tails. **1** : 15, 142–144, *145–147*, 149, 151, 295–296, 380

frog-hopper, see INSECT PESTS.

frost, frozen moisture, found on the ground and on objects in cold weather as a result of the chilling of the air and the freezing of the moisture in it. **4** : 358

fruit, the part of a plant which contains the seeds. In that sense a rose-hip, a beechnut, a pea-pod, a strawberry, an apple, a melon, and a ear of wheat or barley are all fruits. But we use the word in a more limited sense for those fruits that are particularly fleshy, juicy and good to eat like apples, oranges, pears, plums, cherries and gooseberries. **1** : *234*, 328; **6** : *60*

Fry, Elizabeth, a great Englishwoman who, with her friend Mrs. Buxton, devoted her life to bettering the conditions of people in prison. She was a QUAKER. She lived from 1780 to 1845. **3** : 282–283

fuchsia, an ornamental shrub, originally brought from America, with bright reddish or purplish hanging flowers. **1** : 248

Fujiyama, the most famous mountain in Japan, beloved of

Japanese artists. It is a dead VOLCANO. **2** : *158*, 254

fungus, a plant that cannot make its own food because it has no chlorophyll (see PHOTO-SYNTHESIS). It lives on decaying animal or plant remains, or as a PARASITE on living plants and animals. MOULD, MUSHROOMS and toadstools feed on non-living matter, while MILDEW is a parasitic fungus. Many kinds of fungi are good to eat, such as mushrooms, and yeast, which is used in making bread, but there are also many kinds that are highly poisonous. Fungi reproduce by means of SPORES. **1** : 262–266

funicular railway, a special type of railway used up steep slopes. **4** : 228

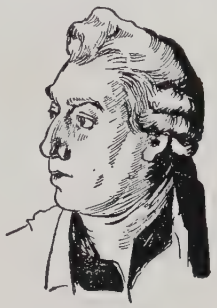
furrow, a trench or channel in the earth made by a plough. **1** : 346

furze, see GORSE.

G

Gabriel, Archangel, the angel sent to announce to Zacharias, a priest of Judaea, that he would have a son called JOHN who would prophesy the coming of a Saviour. **6** : 191

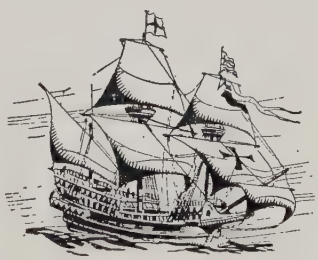
Gainsborough, Thomas, a famous 18th-century English



painter in oils and in water-colours. He painted many rich or famous people such as Mrs. Siddons and the Duchess of Devonshire, usually with a countryside background. He lived from 1727 to 1788. **5** : 143–144; **3** : 239

Galileo, an early Italian scientist who, among other things, introduced the PENDULUM principle into clocks. His study of the stars led to much progress in this field of knowledge. He lived from 1564 to 1642. **4** : 381

galleon, a large sailing ship



with three or four decks, formerly used by the Spaniards. **3** : 186

gall-wasp, see INSECT PESTS.

galvanometer, a device for measuring the flow of electricity in a circuit. **4** : 148–149

Gama, Vasco da, a Portuguese explorer who sailed up the east coast of Africa. He lived from 1469 to 1524. **3** : 154

game birds, wild birds that are hunted for sport and are good to eat when killed. They

are protected by law and may not be shot during the breeding season or close season as it is termed. They nest on the ground and include the grouse, partridge and pheasant.

1 : 93, *95–96*, 97–99, 101

game fish, in Britain, normally the grayling, a fresh-water fish of fast clear streams, the trout and the salmon. 6 : 249

games, outdoor or indoor activities. Outdoor games like CRICKET and FOOTBALL are contests of skill between groups of players. They give us exercise and teach us to play and work as part of a team.

6 : 213–220, 233–239, 243–245

Of course, there are also the games we play in the school playground such as hop scotch or leap-frog (6 : *212*) and games suitable for parties like blind-man's-buff and forfeits. Indoor games, apart from party games, are usually quiet games of skill like dominoes and draughts (6 : 243–245).

Ganges, the chief river of northern INDIA, is more than 1,500 miles long. Its waters are considered sacred by the Hindus.

2 : 236

gannet, a large sea bird that is a powerful swimmer and also a strong flier. It lives on fish and will dive into the water from high in the air when it sees its prey. 1 : 14, *108*

garden, the ground around a house where you can grow flowers and vegetables. Many varieties of wild plants have been cultivated to produce large and beautiful blooms suitable for gardens ; as well as the flower beds a garden may have a grass lawn, a pergola, or covered walk covered with climbing plants, a rock garden, a greenhouse, and perhaps a pool with lilies. If there is a separate part of the garden for vegetables it is called the kitchen garden ; a garden for vegetables that is not near the house is called an allotment. 1 : *246*, 247 ; 6 : 50–51

Miniature gardens may be constructed no bigger than a table-top and kept indoors (5 : *329*, 327–331).

Garibaldi, see ITALY.

gases, substances which are neither solids nor liquids. See CHANGES OF STATE. 4 : 43

gas-holder, a huge circular metal structure for storing coal

gas, often wrongly called a gasometer. 4 : 100

gas-lamp, the most up-to-date means of lighting in the 19th century. 4 : 306–307

gas-turbine, a compact, highly-efficient engine, using the expansive force of burning gases to rotate a turbine wheel, which in turn can revolve an aeroplane propeller, etc.

4 : 119–121, *122–123*

gaucho, the cowboy of the Argentine and other South

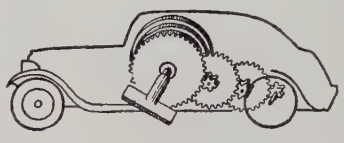
American countries. He is still a familiar and picturesque part of the PAMPAS scene although gradually being replaced by mechanization. 1 : 309

Gauguin, Paul, a French painter who lived from 1848 to 1903. His style at first was that of the IMPRESSIONISTS but he eventually became dissatisfied with this. Gauguin spent eight years in Tahiti, a South Sea island, and he painted many of the people of those parts. His *Girl from Brittany* belongs to an earlier period, when he had first escaped from the boredom of working in a Paris bank. 5 : 152

gazelle, see ANTELOPE.

gears, a system of interlocking wheels between engine and power shaft which enables the operator to make the machine go slowly but with great pulling power, as up a hill, or much faster but with less pulling power, as on the level. See GEAR-WHEEL. 4 : 128–129

gear wheel, a type of wheel by which power can be transferred from one part of a machine to another. Such wheels are often notched and fitted so that the turning of one wheel causes its neighbour to turn, too. They can be seen in the



GEARS which work a clockwork motor-car. 4 : 26–27

generator, also called a dynamo, a machine for producing an electric current. See also ELECTRIC MOTOR. 4 : 150–154, *152*

Genghis Khan, see MONGOLIA.

geography, the science that studies the natural features of the earth. This includes climate, peoples, products, etc., and their distribution. 2 : 9–354

geology, see ROCK-COLLECTING.

George I, Elector of Hanover who became King of Great Britain. As he could not speak English the power of the Prime Minister and his cabinet grew greater during his reign. He reigned from 1714 to 1727.

3 : 223, 225, 342

George II, the Hanoverian monarch who was the last British king to lead his troops in battle, at Dettingen. His reign saw the start of the Industrial Revolution, and the foundations of British power in India laid by Clive. He reigned from 1727 to 1760. 3 : 342

George III, known as "Farmer George" because of his interest in farming, King of Great Britain during the winning of Canada and the losing of the United States. The FRENCH REVOLUTION and the wars with NAPOLEON occurred during his reign. He lived from

1738 to 1820. **3** : 258, 342

George IV, the Regent during his father's illness. He was not a wise ruler, but he encouraged the arts and was interested in architecture. He reigned from 1820 to 1830.

3 : 342

George V, a King of England who always kept a love for the sea. During his reign the First World War was fought. He reigned from 1910 to 1936.

3 : 342

George VI, the brother of Edward VIII, and king during the Second World War. He reigned from 1936 to 1952.

3 : 343

George, St., a Roman officer and Christian who rebuked the Roman emperor for persecuting Christians and was executed, but he is known best for the legend of St. George and the dragon. He is the patron saint of England. His flag is a red cross on a white background and this is flown over parish churches. **3** : 28–30

Georgian times, the period from about 1714 to about 1820 when art and literature flourished and many fine houses were built for the well-to-do. The poor, however, had to suffer the effects of the INDUSTRIAL REVOLUTION, which developed during the second half of this period and changed Britain from a country of farmers and villagers into a country of factory workers and townsmen.

3 : 236–245, *242–243* ; **5** : *212*, 213–214

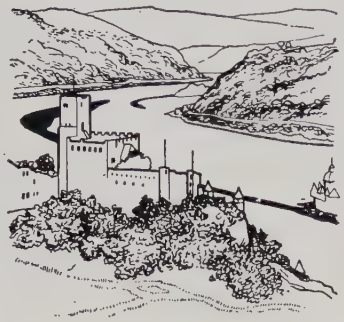
Géricault, Jean Louis, a French painter who excelled at painting spirited horses. He lived from 1791 to 1824.

5 : *113*

germ, a tiny living cell that, according to its type, can grow into an animal, or a plant, or a living part of either. The word is also used for bacteria, harmful to human beings.

1 : 225–226, 369–370

Germany, a great manufacturing country to the east of Holland, Belgium and France and west of Poland. Berlin was the capital of pre-war Germany. The RUHR area is the centre of industry. Rye, oats and wheat are the farm crops. There are VINEYARDS on the Moselle and RHINE, a river with many castles



along its banks, and great forests in the north and south-west. Hamburg and Bremen are the chief ports.

2 : *152–153*, 211–215

Historical figures whose influence has been felt beyond the borders of Germany include Frederick the Great (1712–1786), Britain's ally in the Seven Years' War ; Prince Otto von Bismarck (1815–1898), who united the separate German states into one German empire ; Kaiser William II (1859–1941), ruler of Germany in the First World War ; and Adolf Hitler (1889–1945), Germany's leader in the Second World War.

germination, the growth of a SEED into a young plant. For this to happen the seed must have enough water, warmth and air. A root grows downwards into the ground, while a shoot springs upwards towards the light. **1** : 230

geyser, a spring or gusher of hot water found in the volcanic regions of New Zealand, Iceland and elsewhere. **2** : 93–97

Ghana, West African member of the British Commonwealth, formerly Gold Coast.

2 : *155*

Ghiberti, Lorenzo, an Italian sculptor and painter who made what are probably the most famous doors in the world. He lived from 1378 to 1455. **5** : 173

Ghirlandaio, Domenico del, an Italian painter who lived from 1449 to 1494. He had a gay and contented outlook on life, and even his religious paintings reflect the warmth and colour of his native city of Florence. One of his most famous paintings is the tender picture of *An Old Man and his Grandson.* One of his pupils was Michelangelo. **5** : 110

gibbon, see APE.

Gibraltar, a town and naval base built on a huge rock which commands the entrance to the Mediterranean. The British captured it from Spain in 1704. **2** : *152*, 229

Gigli, Beniamino, Italian opera tenor, born in 1890. This great and popular singer who became Caruso's successor, according to the majority of opera-lovers, was the son of a shoemaker. **5** : 245

gila monster, a very poisonous Mexican LIZARD, bright orange-red and black in colour, heavy and squat in shape, and sluggish in movement.

1 : 133, *136*

Gilbert, William, Queen Elizabeth's doctor and an early experimenter with magnets. He lived from 1540 to 1603.

4 : 142–143

Gilbert, Sir W. S., see OPERA.

gill, an organ for breathing under water, taking the place of the LUNG, in fish. See also FROG and LUNGFISH. **1** : 265

Giotto, a pupil of CIMABUE, whose paintings broke away from the influence of stiff mosaic work to attain more life-like and natural effects. He lived from 1266 to 1337.

5 : 119–120

giraffe, an African animal with a very long neck and long slender legs. It may be as much as 18 feet in height. It feeds chiefly on the leaves of trees. Its spotted coat makes it difficult to see when it is among trees. **1** : *31*, 35–36

Girl Guides, an organization for girls, founded by Baden-Powell, and somewhat similar to the Boy SCOUTS.

3 : 347–348, *349*

glacier, a vast accumulation of ice in a mountain region above the snow-line. Inch by inch it slides downhill and, crossing the snow-line, begins to melt, forming the source of some river. The Rhône begins in this way **2** : *74*, 76–78

gladiators, armed warriors who fought each other for the amusement of the crowd in the days of the ROMANS. One was usually armed with a sword and a shield while the other had a net and a long trident. **6** : *390*

Gladstone, William Ewart, Prime Minister of Britian in the reign of Victoria. **3** : 125

Glasgow, the largest city in Scotland and a great manufacturing centre. It stands on the River Clyde on which are many miles of ship-building yards. **2** : 279

glass, a transparent substance made by melting together a mixture of sand, limestone, and soda or potash. **4** : 260

Glass sheets (**4** : 262) are made by squeezing hot liquid glass between rollers and cooling, and so solidifying it as it is rolled out flat.

glassware, vessels made by

shaping liquid glass and then slowly cooling it. **4** : 260–263

gliding, the sport of flying in an aeroplane without an

engine. The glider has to be pulled into the air by a winch, motor-car, aeroplane, or elastic rope. **4** : 245

Model gliders (**5** : *330*, 334–338) are easy to make and fun to fly. Like real gliders they depend on rising currents of air in order to gain height.

globe-fish, a queer fish of tropical seas that can take in air till it puffs itself out like a football. **1** : 173, *175*

glove puppet, an easily made puppet which is brought to life by inserting your hand so that the first and second fingers enter the hollow neck and the thumb and little finger enter the sleeves and act as arms. A punch and judy show can be worked with glove puppets. **5** : 372–375 ; **3** : 92

glow-worm, see BEETLE.

Gluck, Christopher Willibald, a German composer of operas on classical themes, including *Orpheus and Eurydice.* He lived from 1714 to 1787. **5** : 243

gnat, see FLIES.

gnu, a big clumsy-looking member of the ANTELOPE family with large horns like crescent moons. It lives in Africa and is sometimes called the wildebeest. **1** : *31*, 35

goat, an animal belonging to the same family as the sheep, but much more nimble. The goat provides butter, cheese and milk. Cashmere and mohair are fine materials made from the silky hair of certain kinds of goat. Wild goats live in mountainous regions. **1** : 315, 359

Gobi Desert, a large desert region in central Asia. **2** : *158*

goby, a small fish with suckers on its lower fins. **1** : 156

Godwin, Earl of Wessex, spokesman for the nobles against the Norman associates of EDWARD THE CONFESSOR. He became the real ruler and his son Harold was made king on Edward's death. He died in 1053. **3** : 61–63

Gogh, Vincent Willem van, a Dutch artist of great originality who followed the French

IMPRESSIONISTS. He lived from 1853 to 1890. **5** : 154, *155*

gold, one of the rarest metals in the world, and because of this and its beautiful colour always regarded as a symbol of wealth. It is the standard by which international wealth is measured, and exchanges of money between different countries today are still usually made in gold. **2** : 263, 346–352 ; **3** : 335

Gold was mined in Ancient Britain (**3** : 11, 14) ; in the 19th century it was discovered in Australia (**3** : *304*, 309) and South Africa (**2** : 263, 346–352 ; **3** : 335), which today is the chief gold-producing country in the world.

goldcrest, or gold-crested wren, the smallest of British birds. It is olive green in colour, but the top of its head is bright yellow, deepening into orange. **1** : *95*

Golden Hind, the ship in which DRAKE sailed round the world. **3** : 167

Goliath beetle, see BEETLE.

good manners, the system of everyday behaviour based on politeness and considerateness for one another which helps to make life for all of us easier and more civilized. **6** : 90–91

goods train, a train made up of wagons and trucks of specialized types for carrying goods. Cattle trucks, coal wagons, oil tank wagons and refrigerator vans are some of these kinds. **4** : 215–217

Goodyear, Charles, an American who discovered the process of vulcanizing RUBBER which makes it hard and elastic instead of sticky and useless. He lived from 1800–1860. **4** : 275

gooseberry, the juicy green fruit of a prickly shrub. **1** : 201

goosegrass, a plant that grows well in the hedgerows. The flowers are very tiny and are yellow, white or greenish in colour. Its seeds have hooks on them which get caught in the coats of passing animals and are thereby scattered far and wide. **1** : 237

gorilla, see APE.

gorse, a common plant on heaths, is also called furze or whin. It is often confused with BROOM but can easily be distinguished by its extremely prickly nature. The yellow flowers are smaller than those of the broom. **1** : 236

Gospels, the four accounts (by Matthew, Mark, Luke and John) of the life of Jesus Christ, in the BIBLE. **6** : 190 ; **5** : 40

Goths, see ROMANS.

gourami, a tropical fresh-water fish of China, Malaya and India, greatly valued as food. Usually it is the male who makes a nest of air-bubbles that floats on the surface of the water, but in the case of the dwarf gourami, the female helps in the nest-building. Most gouramis are only a few inches long, but one giant gourami may grow to as much as two feet. It differs from the others in building a nest of water-plants. **1** : *176*, 177

gourd, a desert plant, allied to the water-melon. Its fruit has a spongy pulp and is intensely bitter. **1** : 269

Goya, Francisco, a Spanish painter who painted war (and its effects) realistically, thus showing it to be as horrible as others had made it appear glorious. He was a Spanish HOGARTH, making men dislike their own wicked ways. He lived from 1748 to 1828. **5** : 151, 164

Grahame, Kenneth, a Scottish writer whose *The Wind in the Willows* has become a children's classic. He lived from 1859 to 1932. **5** : 32

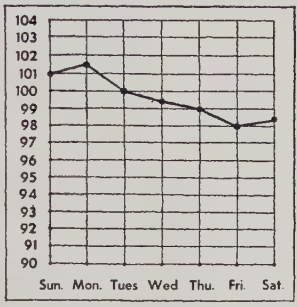
grain elevator, a specially tall warehouse for storing grain. **2** : 330, *332*

grain-ship, a vessel specially built for carrying grain. **4** : *209*

grammar, tells you about the different kinds of words that make up a language and how to use them properly. The main ones are NOUNS, VERBS, ADJECTIVES, ADVERBS, PREPOSITIONS, PRONOUNS, CONJUNCTIONS and exclamations. **6** : 144–155

gramophone, an instrument which can reproduce faithfully any piece of music or speech which has been recorded for it. When the record is being made the sounds of the music cause a needle to vibrate on a rotating disk of wax. The disk, or rather copies of it, called records, can then be made to rotate so as to shake a needle in the gramophone—the earlier process being reversed—and copies of the original vibrations and so of the original sounds result. Nowadays, the reproduction of the sounds is done electrically. See also DICTATING MACHINE and TAPE-RECORDER. **4** : 374–375 ; **5** : 258

graph, a way of showing quantity by means of position. Thus a person's temperature



can be shown as a graph by means of a line joining the various points indicating his temperature from day to day. There are certain instruments which draw their own graph, for example, the thermograph, which measures and charts the temperature of the atmosphere, and the hydrograph, which measures and records the amount of moisture in the atmosphere. **2** : 122

grass, the name given to a family of plants that includes wild grasses such as foxtail or cocksfoot, and food plants such as barley, maize, oats, rye, wheat. These plants which bear grain that we can eat are called cereals. See also FARMING. **1** : 240–241, 328–329, 336–338

grasshopper, an INSECT with very long hind legs, and powerful muscles that enable it to jump great distances. The male attracts the female by a chirping noise produced by rubbing its back legs against its wing-covers. The female has an egg-laying tube at the tip of the abdomen which she uses to lay her eggs beneath the surface of the soil. The young hatch from the eggs, but unlike insects such as the butterfly, they do not go through a complete change of form, or METAMORPHOSIS. Instead, they are born looking like the adult grasshopper but without wings. As they grow bigger their wings grow, also. As they increase in size, they shed their skins, or moult, and this happens many times before the grasshopper is full-grown. See also LOCUST. **1** : *198*, 200, 204–207

grasslands, the name given to the tree-less plain regions of the world, also known as PAMPAS, PRAIRIES, SAVANNAS, STEPPES and VELDT. **2** : 42

gravity, the force which pulls us to the earth making us

fall "downwards" and never "upwards." **4** : 27–28 ; **2** : 363

Every world in the UNIVERSE has some degree of pull on every other, and the pull is greatest the nearer we are to a world. The degree in which the earth pulls us is our weight which becomes lighter, of course, if we could get away from our world in a space-ship. To get to the MOON, for instance, we must overcome the pull of the earth (**2** : 369) and reach a stage where we begin to fall moon-wards. Sir Isaac NEWTON described this force and showed that it existed throughout the stars.

Great Britain, the largest of the islands forming the British Isles. It consists of England, Scotland and Wales. With Northern Ireland it forms the UNITED KINGDOM of Great Britain and Northern Ireland. **2** : *147*

great crested grebe, a WATER BIRD found on lakes and ponds in Britain. It is a good underwater swimmer and diver. Its bill is straight and slender, and the crest on its head divides into two tufts. **1** : 104

greater celandine, a wild plant of hedgerow and waste ground. **1** : 241

Great Fire of London, a five-day fire which destroyed over 13,000 houses and many churches, including St. Paul's Cathedral, in 1666.

3 : 218, *219*

Great Lakes, a chain of five large lakes in North America, comprising Lakes Superior, Michigan, Huron, Erie and Ontario. **2** : 99

Great Plague, an epidemic in England in 1665. It was an infectious illness that caused a great many deaths. The infection was carried from person to person by a type of flea found on rats. **3** : 217–218

Great Wall of China, see CHINA.

Greece, a small but very famous mountainous country forming the southern end of the BALKAN PENINSULA. It includes Crete and many islands in the Adriatic Sea. Athens, its capital, was the centre of culture of the old Greek civilization (see GREEKS). Currants and tobacco are exported. Tourists are another source of income.

2 : 44, 121

Greek drama, plays performed in Ancient Greece which recounted some tragic legends of the gods with all the solemnity of a religious ceremony. There was little action on the stage and much recounting in fine words of what had gone on elsewhere, while a chorus of old men chanted their comments on what was happening. There was no stage in the modern sense. The actors wore high boots and masks so

that their expressions could be seen from a long way off, and they acted in a sort of open-air hollow in front of a great semi-circle of seats rising tier upon tier at their front and sides. The great period of Greek drama was the 5th century B.C., when the tragic writers Aeschylus, Sophocles and Euripides and the satiric Aristophanes were creating works that are still sometimes staged. See DRAMA.

5 : 75–76

Greek painting, see PAINTING.

Greeks, Ancient, the most wonderful people of the ANCIENT WORLD, producing from a small population some of the world's greatest philosophers, sculptors, dramatists and architects. They lived on the mainland of Greece and on the islands in the Aegean Sea in small city-states, the best-known of which were Athens, Sparta, Corinth and Thebes. They loved the arts, especially poetry, music, dancing, sculpture and architecture and were keen athletes, having sports contests every four years at Olympia—the original of our Olympic Games.

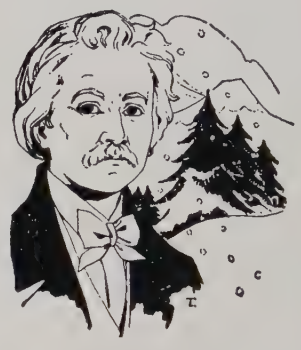
5 : 9–13 ; **6** : *336*

The Marathon race, a long-distance race, is so called because of the runner who ran all the way from Marathon to Athens with news of the Greek victory over the Persians in 490 B.C.

Among the most famous Greeks who contributed to the glory of this age were HOMER, the blind epic poet (lived about the 8th century B.C.); Pericles (died 429 B.C.), a great statesman who tried to unite the Greek cities, but failed because Sparta stood out against him; Socrates (lived 469 to 399 B.C.), a philosopher and teacher who was sentenced to death for not believing in the religion of the day and who calmly drank the poison given to him; Plato (lived 428 to 347 B.C.), a philosopher whose works are still read today; Demosthenes (lived 385 to 322 B.C.), an orator who warned the Greeks of the danger threatening them from Macedonia, a kingdom to their north. Philip, king of Macedonia, appointed Aristotle (lived 384 to 322 B.C.), a Greek thinker and teacher, to teach his son, Alexander. This son, later known as Alexander the Great, conquered the Greek cities and united them, and at their head defeated the Persians. Another Greek teacher was Euclid (lived about 300 B.C.)—his writings on geometry are still the basis of that subject in schools today. Plutarch, who lived in the first century A.D., was the author of the lives of famous Greeks and Romans, and an English translation of his work gave Shakespeare the plots for several of his plays.

greenfly, see APHIDS.

Grieg, Edvard Hagerup, the greatest Norwegian composer.



His work is deeply rooted in the folk music of his country. Most famous is his piano concerto, and his orchestral music for *Peer Gynt*. He lived from 1843 to 1907. **5** : 228

Grimm, Jacob and Wilhelm, German scholars of language who made a great collection of German FOLK-TALES, many of which have become famous to children as "Grimm's Fairy Tales." They lived from 1785 to 1863 and from 1786 to 1859.

5 : 25

gristle, the elastic substance from which bone is formed. It is also called cartilage. **1** : 375

groundsel, a very common plant of which there are over 500 kinds. It rarely grows above a foot in height and its small flowers are followed by a ball of fluff attached to the seeds. This enables the seeds to become widely scattered. **1** : 237

grouse, one of several kinds of GAME BIRDS found in Britain, which make excellent eating. The red grouse is well known. It lives in high moorland country, making its nest in a hollow in the ground, amongst the heather. The eggs may number from six to fourteen, and are reddish-buff, mottled with brown. **1** : *95*

grub, an alternative name for LARVA, the name given to the initial stage of different insects, such as the frog-hopper, ichneumon fly, beetle. **1** : 189–190, 192–194, 196, 199–203, 208–211

Guernsey cattle, one of a breed of dairy CATTLE that came originally from Guernsey in the Channel Islands. These cattle are yellowish-brown in colour, with patches of white. Their milk is abundant and very rich. **1** : 359

Guianas, three countries in South America comprising British, French and Dutch territory. They are called BRITISH GUIANA, French Guiana and Surinam, and their capitals are Georgetown, Cayenne and Paramaribo, respectively. **2** : *165*

guilds, in medieval trade, organizations for the common benefit of townsmen engaged in the same trade or craft, such as bakers, tanners and armourers. **3** : 92, 96–100, 109

guillemot, a web-footed sea bird, related to the puffin. They are mostly black, have slender beaks, and dive off rocks and cliffs into the sea for their fish. The guillemot does not make a nest, but lays just one very big egg on the rocky ledge of a cliff. The egg is pear-shaped and does not roll off into the sea. **1** : *95*

guinea-pig, a small RODENT of South America. It is popular

everywhere as a pet and can be kept in the same way as a pet rabbit. **1** : 326

guitar, a Spanish stringed musical instrument played by picking the strings with the right hand while the left presses down the strings at definite points to produce the different notes. **5** : 262–263

Gulf Stream, the warm ocean CURRENT that flows northeastward across the North Atlantic from the Gulf of Mexico. The Gulf Stream makes the climate of western Europe much milder than that of eastern Canada. **2** : 117–118

gull, a white sea bird with black markings and webbed feet. There are several kinds. Most nest on sea-cliffs, but some nest inland in river valleys. **1** : *108*, 109–110, 302

"Gulliver's Travels," see SWIFT.

Gunpowder Plot, see FAWKES.

guppy, a small tropical fish which feeds on the LARVA of the mosquito and multiplies very rapidly. It is in great demand for the home aquarium. **1** : *176*, 177

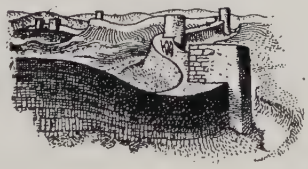
Gutenberg, see PRINTING.

Guthrum, the 9th-century Danish king who was defeated by King ALFRED. See also DANES. **3** : 54

gymnastics, exercises to keep one fit and strong to be practised indoors or in a gymnasium. They include exercises in agility, such as performing hand stands, cartwheels, forward and backward rolls. Advanced work is done on apparatus, for example, the trapeze, vaulting horse, parallel bars and so on. **6** : 251–252, 257–258

H

Hadrian's Wall, a fortified wall extending from the Solway



Firth to the Tyne, built by the Romans during the Emperor Hadrian's reign against raiding Picts. **3** : 31

haemoglobin, a red pigment, or colouring matter, in the red cells, or corpuscles of the BLOOD. It takes in and distributes the oxygen. **1** : 367, 369

Haggard, Sir Henry Rider, an English novelist whose adventure stories about the big game hunter, Allan Quatermain, and his friends in 19th century Africa have delighted children no less than adults. *King Solomon's Mines*, *She* and *Allan Quatermain* are among the best. He lived from 1856 to 1925. **5** : 70

Hals, Franz, a Dutch painter who lived from 1580 to 1666. He was the first great portrait painter of Holland and excelled in capturing jovial and merry scenes on his canvases. His most famous work is probably *The Laughing Cavalier*. **5** : 256

hamster, a small RODENT related to the lemming and the

vole. The golden hamster is the best-known, and makes an amusing pet. It has large cheek pouches in which it can store grain, and in its wild state it causes great damage to crops. **1** : 326

Handel, George Frederick, a German composer who settled and lived in England. His greatest work is the *Messiah*. He lived from 1685 to 1759. **5** : 243, 248, 250

Hannibal, see ROMANS.

hare, a gnawing animal like a large rabbit, but stronger and more solitary in its habits. **1** : 40, 43

Hargreaves, James, see INDUSTRIAL REVOLUTION.

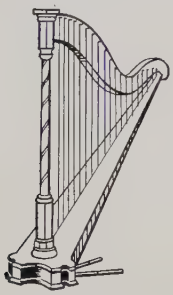
harmonica, or mouth organ, a musical instrument consisting of a shallow oblong case, containing a series of metal reeds through which you blow and suck air. **5** : 260–261

harmony, the fitting of other notes to a MELODY in order to enrich it and make it sound more musically satisfying. **5** : 259

Harmsworth, Alfred Charles William, Lord Northcliffe, the journalist and newspaper-owner who did most to make the newspapers of this century cheap and popular. He lived from 1865 to 1922. **3** : 341

Harold II, second son of GODWIN, Earl of Wessex. He succeeded EDWARD THE CONFESSOR at a time when William of Normandy claimed the throne. When the Normans invaded, Harold was killed at the Battle of Hastings. He lived from 1022 to 1066. **3** : 65–66, 68–70

harp, a very old plucked stringed instrument, having 46



strings of different length set in a triangular frame. The harp is used in a full ORCHESTRA.

5 : 229

harpoon, a long spear, used for killing whales, turtles, and large fish. See also WHALING.

1 : 308, *311*

harrier, a beautiful and graceful BIRD OF PREY. Well known species are the marsh harrier, hen harrier and Montagu's harrier. They live chiefly on mice, rats, rabbits, and frogs.

1 : *107*, 115–116

Harris, Joel Chandler, American author whose *Uncle Remus* stories about the wise Br'er

Rabbit and the not-quite-so-clever Br'er Fox have delighted generations of American and British children. He lived from 1848 to 1908. **5** : 31

harrow, a farming instrument consisting of a frame set with teeth, which, when dragged over ploughed ground, levels it, and breaks up the soil.

1 : 334, 348, 350–351

Harte, Francis Bret, an American story-teller of the last century who made known to the stay-at-homes through his short stories, the rough and lively life of the "Wild West" and especially of the gold-seekers' mining-camps. He lived from 1836 to 1902. **5** : 53–54

hart's-tongue, an attractive FERN with narrow, strap-shaped leaves. **1** : 260–261

Hastings, Warren, the merchant who became the first British Governor-general of India. He lived from 1732 to 1818. **3** : 255

hawk, one of the group of birds known as BIRDS OF PREY because they hunt other birds and small animals. They have strong curved claws, or talons, and hooked beaks.

1 : *107*, 114–116, 299

The sparrowhawk, found over most of Europe, is the only true hawk found in Britain. The female is much bigger and more powerful than the male, and hunts bigger birds such as partridge and pheasant. The male catches small birds such as tits (*107*, 114, 115). The goshawks of Africa and America resemble the sparrowhawk and catch their prey in the same way with their talons.

hawthorn, or may, a SHRUB or small tree which blooms in May. It has shiny leaves, white or pink sweet-scented flowers, and small red fruits called haws.

1 : 218, 345

Haydn, Franz Josef, an Austrian composer of more than a hundred SYMPHONIES and about as many string quartets. He twice visited England and received a degree from Oxford University. He lived from 1732 to 1809.

5 : 235, 238–239, *248*, 253

hazel, a bush or small tree which bears a rounded eatable nut, sometimes called a filbert.

1 : 235, 238

health, the state of the body when it is working perfectly. The enemies of health are insufficient or the wrong kinds of food, lack of fresh air and exercise, and dirty houses. During the last century a great deal has been done to abolish these enemies, and to improve the health of the people.

3 : 380–383

Health Service, National, see NATIONAL INSURANCE.

heat, a form of energy.

1 : 362, 366, 371 ; **4** : 31–52

It spreads by radiation, convection and conduction (**4** : 31–32) and is a great help to us in keeping us warm and in cooking our food, for which there are many domestic appliances (**4** : 34–35). It affects the physical qualities of a substance, thus ice becomes water and water becomes steam as it absorbs more heat (**4** : 43–44). It is a factor involved in burning (**4** : 47–51). See also THERMOMETER.

heart, a hollow organ in the body with muscular walls which expand and contract regularly, drawing blood from VEINS and pumping it to the LUNGS to collect more oxygen. The blood then returns to the heart and is pumped along the ARTERIES. Valves in the heart prevent the blood from flowing in the wrong direction. The adult human heart is about five inches long and three and a half inches broad. We can feel the pumping of the heart if we put our finger on our PULSE.

1 : 367, 369–372, 374

hedgehog, a spiny MAMMAL which can curl itself into a ball when likely to be attacked. It is a night wanderer, snuffling around in the darkness in search of insects, worms, snails, and slugs. It also occasionally eats fruits. **1** : 50–52

hedge parsley, see CHERVIL.

Helen of Troy, in Greek legend, a daughter of ZEUS. Her beauty was the cause of the Trojan War. **5** : 11

helicopter, a type of aeroplane having a large three-

bladed propeller revolving horizontally overhead, which enables

it to go straight up or down or to hover in one place.

4 : 240–245

It is useful for rescuing people from awkward and dangerous situations (**4** : 247).

heliograph, an instrument once much used for flashing messages but long supplanted by the telegraph. **4** : 325

helmets, the hats worn by soldiers, originally as part of their armour and later as a form of decoration. **3** : *20*

hemisphere, one half of the earth's surface. The division can be made horizontally at the equator, thus giving a northern and southern hemisphere, but it is also made vertically through the Atlantic and Pacific Oceans to give western and eastern hemispheres. **2** : 168

hemlock, a plant with fern-like leaves, which bears its small white flowers in clusters. It is poisonous, and is supposed to have been the poison which caused the death of Socrates (see GREEKS). **1** : 242

hen, the name for the female of any bird, most commonly applied to the domestic fowl. **1** : 305

Hengist and Horsa, two leaders of the Jutes who settled in Britain. **3** : 33–34

Henry I, son of William the Conqueror. He took the throne from his elder brother Robert and married the daughter of the Scottish king. He granted a "Charter of Liberties" which became the basis for the later Magna Carta. He reigned from 1100 to 1135. **3** : 81–85, 342

Henry II, the King of England who caused the murder of Thomas Becket, Archbishop of Canterbury. He reigned from 1154 to 1189. See also ASSIZES. **3** : 85–87, 342

Henry III, the king against whom Simon de Montfort led the barons in demanding the beginning of the English PARLIAMENT. He reigned from 1216 to 1272. **3** : 342

Henry IV, the King of England who seized the throne from RICHARD II. He was the first of the Lancastrian line of kings, and he reigned from 1399 to 1413. **3** : 343

Henry V, the king who conquered Wales for his father and continued the war against France by crossing to the continent and winning the great Battle of Agincourt. He married Catherine, daughter of the French king. He reigned from 1413 to 1422. **3** : 140–144, 343

Henry VI, the King of England who came to the throne while still a boy. He had to fight for his throne against the family of York in the Wars of the ROSES and was eventually defeated and murdered. He reigned from 1422 to 1461. **3** : 148–149, 343

Henry VII, the King of England who ended the Wars of the ROSES. He married Elizabeth of York, thus uniting the warring families. He reigned from 1485 to 1509. **3** : 150, 197, 342

Henry VIII, the King of England who quarrelled with the Pope, made himself head of the Church in England, and suppressed the monasteries. See REFORMATION. He was married six times. His first wife was Catherine of Aragon, whom he divorced ; she was followed by Anne Boleyn, whom he also eventually divorced, and beheaded. He then married Jane Seymour, who died the following year. Anne of Cleves came next, but Henry parted from her after three days. Immediately afterwards he married Catherine Howard, but had her beheaded within two years. His last wife, Catherine Parr, was a widow before she married him and she outlived him. Henry VIII reigned from 1509 to 1547.

3 : *2*, 160–165, 342

Henry the Navigator, a Portuguese prince who organized the 15th-century exploration of the west coast of Africa. He lived from 1394 to 1460. **3** : *152*, 153

heraldry, the study of coats-of-arms. These have grown out of the distinctive marks and devices worn by nobles and knights so that they could still be recognized in battle when covered with their armour. **3** : 102–107, *103*

Hercules, the Roman form of the name Herakles, son of ZEUS and the mightiest hero in Greek myth. He strangled serpents while in his cradle and was made a god by the Greeks for his courage and strength. **5** : 8–10, 13

herdsmen, an advance on early hunters, since by taming animals they could take their food supply about with them. **3** : 10

Hereward the Wake, the last of the English leaders to hold out against William the Conqueror. **3** : 74, *75*

Herod, the man who had many infants slain, in the hope of killing the infant JESUS, of whom he was jealous and afraid. **6** : 192

heron, a wading bird, related to the stork, found in marshes and swamps. It has very long thin legs and a slender pointed bill with which it catches fish and frogs. Herons nest in groups, or colonies known as heronries, much as rooks do. Some build their nests in the trees. Egrets belong to this

family, and are famous for their lovely breeding-plumage known as "osprey" feathers in the fashion world. 1 : 119

herring, fish found in great shoals in the North Sea and making an excellent food for the table. 1 : 182–184, *185*

Hertz, Heinrich Rudolf, a German physicist was the first to get the basic idea of wireless. He lived from 1857 to 1894. 4 : 179

hide, a place in which to remain concealed from view. A bird-hide, for example, is a structure which can be set up in the garden, so that you can hide inside it and watch the birds without their being aware of your presence. 1 : 80

Highway Code, see CYCLING.

highwayman, a road robber, often a masked horseman, who held up coaches and other travellers, at pistol point. Dick Turpin was the most famous of highwaymen, but he was caught and hanged like many others. The 17th and 18th centuries were the heyday of the highway robber. 3 : 250

hiking, anything from a cross-country walk to a walking tour lasting for weeks. 6 : 232

Hill, Sir Rowland, see POSTAL SERVICE.

Himalayas, a large mountain range between INDIA and TIBET. The highest peak is Mount EVEREST, which is also the highest peak in the world. 2 : 238

hippopotamus, a huge thick-skinned African MAMMAL that

likes to rest almost submerged in the water and is seldom found far from rivers. 1 : 28–33, *31*

history, the study of past times and events ; also the narrating of such events, explaining their real influence. 3 : 9–383

Hitler, Adolf, the leader of the Nazi party, which governed Germany for thirteen years. Although some people admired his methods, his successes were obtained at the cost of great cruelty. He led Europe into a terrible war, in which his country was utterly defeated. 3 : *2*, 352–354, 356–357

hive, see BEE.

hobbies, constructive pursuits for one's leisure time such as making collections, the practice of various forms of arts and crafts, model-making, etc., and the spare-time study of any subject for the pleasure it gives you. 5 : *286*, 287–383

Hobbema, Meindert, a Dutch landscape painter who lived from 1638 to 1709. He excelled in pictures of the Dutch countryside, and his most famous painting is undoubtedly *The Avenue*, with its long vista of trees down either side of a country road. 5 : 142

hockey, an eleven-a-side team game for boys or girls, played with a white leather ball and strong curved sticks for hitting it. Goals are scored by driving the ball through the opponents' goal posts. 6 : 258–262

Ice-hockey is played by skaters on ice with a rubber disk, called a puck.

hoe, a garden or farming tool consisting of a thin blade attached to a long wooden handle. It is used for loosening the soil, weeding, etc. 1 : 352

Hogarth, William, an English artist, who, besides painting portraits, painted imaginary scenes from the life of his day so as to try to make us hate wickedness and folly. Many of his pictures are like sermons. He lived from 1697 to 1764. 5 : 149–151, 164 ; 3 : 124

holiday, originally Holy Day, a joyous day—a festival or feast day—associated usually with religion. 3 : 109–110

Holland, or the Netherlands, the small flat country of the Dutch people, lying north of Belgium and west of Germany. The Dutch are great seafarers

and from AMSTERDAM, the capital, and Rotterdam at the mouth of the Rhine, Dutch trading ships sail far and wide. Tulip and daffodil bulbs are grown in vast numbers, and farm produce, especially cheese, is exported. Some of Holland is so low-lying as to need huge dykes to keep the sea from flooding the land. 2 : *152–153*, 207–211

holly, an EVERGREEN tree or shrub, with poisonous red berries. 1 : 257–258

Holst, Gustav Theodore, an English composer who was partly Swedish in ancestry. He wrote strong and stern music of very original flavour, amongst the best known of which is an orchestral suite, *The Planets*, and an opera, *The Perfect Fool*. He lived from 1874 to 1934. 5 : 251

Homer, the greatest poet of ancient Greek literature. He is believed to have been a blind harpist of the 8th century B.C. To him is ascribed the *Iliad*, a long story in verse relating the adventures of the hero Achilles during the Greek siege of Troy to recover the beautiful HELEN ; also the *Odyssey* which sings the heroic adventures and misfortunes of Ulysses (in Greek, Odysseus) during his long journey home to his patient wife, Penelope. 5 : 10–12

homes, the buildings in which people live. 6 : 40, *41–42*, 43–48.

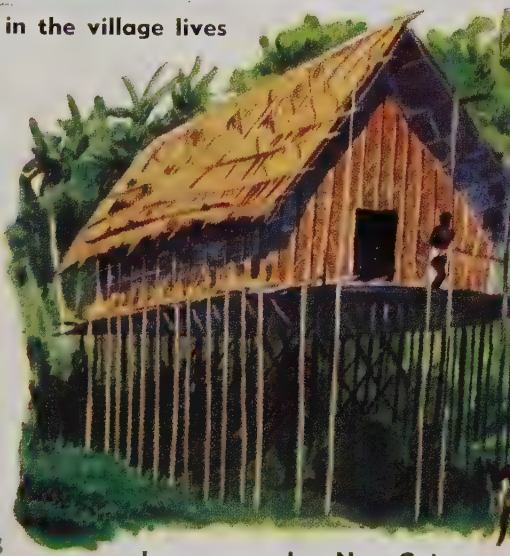
They have always varied greatly in different ages and different lands, according to such things as climate, building materials available, the wealth of the owners and the stage of

tree-house in an Indian jungle

wind-break of the Australian aborigines

long house, Borneo, in which everybody in the village lives

Zulu hut in Southern Africa



house on poles, New Guinea

Y-B

HOUSES VARY FROM ONE PART OF THE WORLD TO ANOTHER

THESE CREATURES NEVER EXISTED—THEY BELONG TO MYTH AND LEGEND

development of the society concerned. There are many different types of primitive homes. **6** : *353* ; **5** : 181–190 ; **3** : 12, 15

Notable styles in the history of domestic architecture include the Roman villa (**3** : *19*, 23–26 ; **5** : 205–206, 208), Saxon houses (**3** : 40–43, *46–47*), Norman and other CASTLES, Mediaeval houses (**3** : *93*, 95, 129), Tudor houses (**5** : 209–210, *211*, 213 ; **3** : 178, *180–181*, 183–186), Georgian houses (**5** : *212*, 213–214 ; **3** : *242–243*, 237–239), and Victorian houses (**5** : 215–217 ; **3** : *301–303*, 205–206).

During the INDUSTRIAL REVOLUTION slums sprang up in the growing industrial towns, where poor people lived in shocking conditions (**3** : 230, 233–234, 325). Some of these slums are still with us, but they are gradually being replaced by modern housing estates and flats. Modern homes vary from the temporary prefab to bungalows, houses, blocks of flats and skyscrapers (**5** : 217–220 ; **3** : 325, 382–383).

honey, see BEE.

honeydew, a sweet sugary juice which APHIDS extract from plants. The aphids in turn are "milked" of the honeydew by certain kinds of ant. **1** : 214

honeysuckle, a climbing PERENNIAL plant found in woods and hedgerows. The sweet-scented flowers are rich in nectar and attract many insects. **1** : 250

Hong Kong, a British colony since 1841, consisting of an island off the coast of China together with a piece of the mainland. **2** : *159*, 247–248

Hooch, Pieter de, a Dutch painter, famous for his interiors and courtyards of houses. He lived from 1629 to 1680. **5** : *138*

hoopoe, a crested bird about the size of a thrush, which comes from parts of Africa and Europe. It is black and chestnut brown in colour. **1** : *117*

hornet, a large type of WASP with a very severe sting. **1** : 220, 299

hornet clearwing moth, a moth that looks so like the dangerous stinging hornet that birds and other enemies are likely to think again before eating it. See also MIMICRY. **1** : 195, 299

horse, a large hoofed MAMMAL which feeds on grass. It has long been domesticated and used all over the world for riding and for pulling vehicles. **1** : 317–319, *321*, 359–360

horse-chestnut, a large, handsome flowering tree, with soft wood. Its nuts are bitter, but useful for playing "conkers" with. **1** : 257

horseshoes, an old American game in which the players throw horseshoes in such a way as to drop them over a stake stuck upright in the ground. **6** : *254*

hour-glass, a device to measure time. It has two parts, with sand in the top part, and the sand runs down into the lower part, taking an hour to do so.

4 : 378–379

houses, see HOMES.

Hovercraft, a vehicle that floats on a cushion of air caused by a big fan at its centre. These can travel at high speed over flat surfaces, such as water or desert, and require no road or harbour installations. **4** : 205

Howard of Effingham, Lord, the admiral of the English fleet that defeated the Spanish ARMADA. His flagship was the *Ark Royal*. **3** : 187–188

"Hucklebury Finn," see TWAIN.

Hudson, Henry, the English explorer who died seeking the NORTH-WEST PASSAGE to China. He died in 1611. **3** : *170*, 174–175

Hungary, an agricultural country of eastern Europe. Its capital is BUDAPEST and its chief rivers are the DANUBE and one of its tributaries, the Tisza. **2** : *152–153*

Huns, see ROMANS.

hunters, men who live by hunting wild animals, either for food or for their fur. The first men on earth were hunters, until they learnt how to rear cattle and then to grow crops. Some races, such as the Eskimos, still live by hunting. There are also wild animal hunters in Africa, and fur trappers in Canada. **1** : 308–313, *311* ; **3** : 8–10

hurdling, see ATHLETICS.

husky, see DOG.

Hwang-ho, a river of northern China, 2,600 miles long. **2** : *158*, 250

hyacinth, a plant of the lily family, which bears spikes of sweet-smelling, bell-shaped flowers in the spring. **1** : 123

hydra, any of several freshwater POLYPS which form fresh polyps when cut or divided. **1** : 274

hydro-electric power, electric power obtained from falling water which is made to revolve water turbines. As these turbines revolve they work electricity generators, creating a powerful supply of electric current which is fed through cables to the towns. **4** : 79–80, 82–83

hyena, a flesh-eating MAMMAL of Africa and Asia. Somewhat like a dog in appearance, it is more nearly related to the cat family. It is a scavenger, feasting like the jackal on the leavings of the lion. **1** : 34

I

Iberian Peninsula, the south-western region of Europe, comprising SPAIN, PORTUGAL and GIBRALTAR. **2** : *152*

ice, the solid state of WATER. See CHANGES OF STATE. **4** : 44–45

When water freezes it expands with great force, and has a splitting action even on rock (**2** : 73–76).

ice-age, a period of great cold which brought polar conditions to much of northern Asia, Canada and Europe, including most of Britain. **2** : 78 ; **3** : 9

iceberg, a mass of ice that has broken off from a GLACIER and drifts away on ocean currents, only about one-ninth being visible above the surface of the water. **2** : 118

ichneumon, an insect which lays its eggs inside the bodies of other insects. When the grubs

hatch out they feed on the body of their unwilling host, until the insect dies. Ichneumons therefore help to destroy garden pests and in this way protect garden produce. **1** : 202

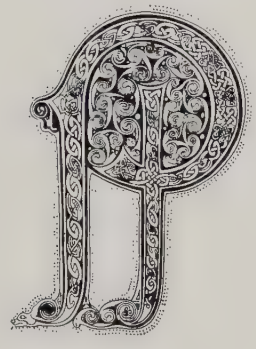
ichthyosaur, a large reptile, fish-like in shape, which lived in the seas many millions of years ago. **1** : *281*, 285

igloo, the simple temporary dwelling of frozen snow which the Eskimo still builds for himself in winter-time, when travelling, although he is likely now to have a wooden hut for his permanent home.
2 : 62 ; **5** : 184

iguana, see LIZARD.

"Iliad", see HOMER.

illumination, the enriching of manuscripts by colouring



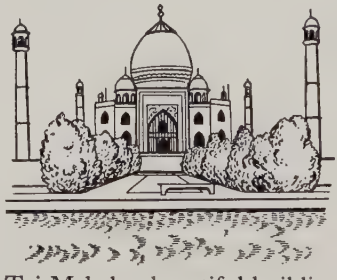
initial letters and embodying little pictures or designs in them, an art of the mediaeval monks.
5 : 38, 118–119

impressionism, a style in French painting which arose in the 60's of the last century, following the study of CONSTABLE and TURNER. Artists of this movement began to draw realistically what the eye sees rather than what the mind knows to be there. They gave their *impression* of the scene, and were greatly interested in the changing lights and colours from dawn to dusk and at different seasons of the year. Manet, Monet, Renoir and Degas are among the great impressionists. **5** : 152–159

in-breeding, the breeding or mating of two animals closely related by blood. This is frequently done in the case of horses, cattle, sheep, for example, to fix good qualities in a strain. **1** : 360

India, a republic of Asia, and a member of the BRITISH COMMONWEALTH, with a population of about 360 million, mainly Hindus. The capital is New Delhi. Bombay is the largest city and manufacturing centre, and an important seaport. Another great port is Calcutta. India is separated from the rest of Asia by the HIMALAYAS, the highest mountains in the world, from which flow the great rivers : the Indus, the sacred Ganges, and the Brahmaputra. Rice, jute, tea, and cotton are its exports.
2 : *158–159*, 233–238, *241*

India was invaded by the Aryans in ancient times, and later by Alexander the Great. The Greeks were driven out and a line of Indian emperors ruled the continent, of whom the most famous was Asoka ; but from about the 6th century all central power decayed, the continent was exposed to invasions from all sides, and into ceaseless civil war. This continued until the Mogul, or Mongol, Emperors gained control in the 16th century. It was a Mogul emperor who built the



Taj Mahal, a beautiful building in marble, as a tomb for his wife. At this time European settlers began to arrive, and for a time there was fighting between the British and French. Thanks to the leadership of CLIVE, Britain gained the advantage, and in the 19th century the whole country passed into the BRITISH EMPIRE. There was a rising against the British in 1857 known as the Indian Mutiny. After agitation for independence, led by Mahatma Gandhi, India gained independence from British rule after the Second World War. The larger Hindu part of the country was separated from the northern Moslem areas, which became the country named PAKISTAN (**3** : 153–154, 157–159, 251–255, *253*, 362–365).

Indian game, a breed of game fowls, produced by crossing the black-breasted red game with varieties from India and Sumatra. **1** : 360

Indian Ocean, an area of water between the coasts of southern Asia and eastern Africa. **2** : *158–159*

Indonesia, a country of south-east Asia, comprising most of the islands of the East Indies. The capital is Djakarta on the island of Java. **2** : 349

Indus, a river of north-west India, 1,700 miles long, flows from Tibet, through Kashmir and Pakistan to the Arabian Sea.
2 : *158*, 234

Industrial Revolution, the change that took place, in the 18th and 19th centuries, from making things with hand-tools in the home or shop to manufacturing them with machinery in workshops and factories specially built to house groups of people working together. This needed first the invention of machines that could be driven by water- or steam-power and also of improvements to make machinery more productive. Britain led in invention, particularly in the making of wool and cotton cloth, and was for a long time renowned as the "workshop of the world." **3** : *222*, 226–235

Among the new chief inventions were John Kay's flying-shuttle, James Hargreaves's "Spinning Jenny," Sir Richard Arkwright's power-driven spinning frame and Samuel Crompton's "mule" for spinning muslin (**3** : 227). This tremendous change in industry caused much misery. Men lost the power that went with owning their own tools, for now only the factory owners had the machinery and they could employ or dismiss people on their own terms. Bread was dear, housing bad, disease common, wages low (**3** : 233–234) and often young

children had to work for 13 hours a day in factories or mines (**3** : 234–235). See also GEORGIAN TIMES.

industry, the general term applied to the extraction, manufacture or trading of materials, food or goods. One example is COALMINING. **2** : *147*, 266–352

See also BUILDING, COTTON, GLASSWARE, IRON AND STEEL, LEATHER, LINEN, NYLON, PAPER, PLASTICS, POTTERY, PRINTING, RAYON, RUBBER, SHIPBUILDING, SILK, TIMBER, WOOL.

inertia, the sluggishness that must be overcome to change anything, be it a football or a mountain, from a state of rest to a state of motion. Once in motion a moving object "dislikes" being made to stop, so inertia must again be overcome. **4** : 29–30

Inquisition, see SPAIN.

insect, animal without a backbone but with a tough, horny skin or outer skeleton. The name comes from the Latin word *insectum*, meaning "cut into" and this describes the body, which is divided into three parts. The first is the head : this bears the eyes, one pair of feelers and the mouth parts, which are adapted for biting and sucking or for piercing and sucking. The feelers carry the organs of touch and smell, and the mouth parts carry the sense

of taste. The second part is the thorax, or middle part. It bears three pairs of legs and, in flying insects, the wings. All insects have six legs, but all other animals have either more or less than six. The third part is the abdomen, or hind part. This may bear a sting, as in WASPS, or an egg-laying tube, as in the female GRASSHOPPER. Insects breathe through a series of openings along each side of the abdomen ; these openings lead into air-tubes which branch to all parts of the body. Nearly all insects live on land and in freshwater streams and ponds, but there are certain kinds of water bugs and gnats that live in the sea. See also ANT, BEE, BEETLE, BUTTERFLY, DRAGONFLY, FLIES, INSECT PESTS, METAMORPHOSIS, MOTH. **1** : 18, *186–188*, 189–223, *198*, 292

insect-eating animals, see AARDVARK, ANTEATER, ARMADILLO, INSECTIVORES, PANGOLIN, SLOTH.

insect-eating plants, plants that can trap and digest insects as well as making their own food by PHOTOSYNTHESIS. They include the BLADDERWORT, BUTTERWORT, PITCHER PLANT, SUNDEW, and VENUS' FLY-TRAP. **1** : 269–271

insecticide, a chemical preparation for killing insects. One of the most commonly used throughout the world is popularly known as D.D.T., dichlorodiphenyl-trichloroethane. **1** : 206

insectivores, the name given to a group of insect-eating MAMMALS with long snouts and sharp teeth. HEDGEHOGS, MOLES and SHREWS form the group, but in spite of their name, they eat slugs and snails as well as insects. Insect-eating BATS, belong to a different group of mammals. **1** : 50–54

insect pests, those insects which have a harmful effect on man by eating his crops or in other ways spoiling his growing plants and trees. Among these pests is the sawfly, which bores holes in plants to lay its eggs there ; the greenfly, which sucks the sap of plants ; the frog-hopper which deposits its grubs in a white frothy covering called cuckoo-spit, which again is made from the sap of plants ; the leaf-miner, a tiny insect whose LARVA burrows into and eats the leaves of plants ; the weevil, a beaked beetle which damages fruit and grain ; the gall-wasp, which lays its eggs in plants ; the winter moth caterpillar which feeds on oak leaves ; and the rosechafer which destroys rose leaves.

1 : 199–203, 209–210, 352

instinct, a natural inborn urge in animals which leads them to behave in certain ways. **1** : 300–304

intelligence in animals, a subject on which opinions vary. All animals follow certain inherited patterns of behaviour. A few can alter the pattern

because they are able to reason, others because they imitate the ways of their parents, and all animals can learn from experience. **1** : 288–291

intestine, also called the bowels, the lower part of the ALIMENTARY CANAL. Food passes from the stomach into the small intestine, which is a tube about 22 feet in length, where most of our digested food is absorbed by the body. The remainder passes into the large intestine and waste products are expelled from the body through an opening called the anus. See DIGESTION. **1** : 362, 371–372

inventions, machines, engines, instruments and other devices thought out in order to make work easier and faster and to enable us to do things beyond our normal capacity. They range from a simple lever to an atomic power station. **4** : 9–383 ; **6** : 372

invertebrates, animals without backbones. This group includes CRUSTACEANS, INSECTS, MOLLUSCS, SPIDERS, and WORMS. **1** : 16–18, *19*

Iran, see PERSIA.

Iraq, an Arab country between Saudi Arabia and Persia in south-west Asia. It produces most of the world's date crop and has extensive oilfields. The chief towns are Baghdad, the capital, Mosul, and Basra, its seaport. **2** : 44, *158–159*

Ireland, an island in the BRITISH ISLES that is divided into two countries. The Republic of Ireland (Eire) occupies the greater part and its capital is

Dublin. Northern Ireland, of which Belfast is the capital, is a self-governing division of the UNITED KINGDOM.

2 : *147*, *152–153*

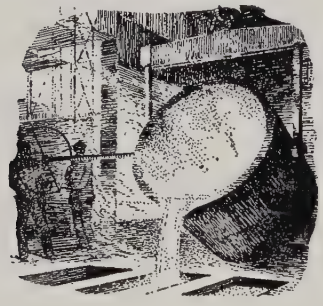
Ireland, John, an English composer of many lively songs and piano pieces as well as some orchestral and choral works. He was born in 1879. **5** : 251

iron, the most widely used of all metals. It is silvery-white, heavy, tough, but rusts easily.

1 : 364 ; **2** : 212, 280–284

Iron-smelting (**2** : 282 ; **4** : 252) is the process of getting iron from IRON-ORE. This was first done by heating the ore with charcoal, a slow-burning fuel made from burnt oak. When the trees were used up COKE was used instead (**3** : 229).

iron and steel industry, the industry which gets iron from IRON-ORE by smelting, and STEEL by toughening iron, thus providing the materials for making



many things from ships to pins and needles. **4** : 252–259, *253–254* ; **2** : 280–284

Iron or steel sheets covered with a film of zinc is known as galvanized iron (**2** : 284).

iron-ore, rock in which iron is found and which yields upwards of a fifth of its weight in iron. **2** : 280 ; **4** : 252, *253*

iron oxide, see RUST.

irrigation, bringing water to waterless districts by a system of channels into which the waters of rivers and lakes are diverted. The water is used in the growing of crops and for cattle, etc. **2** : 39

Irving, Washington, a great figure in early American literature. He was essayist, historian and diplomat, and his *Rip Van Winkle,* now a favourite children's story, is contained in his *Sketch Book.* He lived from 1783 to 1859. **5** : 29

Israel, originally an ancient kingdom in Palestine, now the name given to a new Jewish State created in 1948 by the splitting up of Palestine (see also JORDAN). Jerusalem is the capital, Haifa and Jaffa are the chief ports. **2** : *159* ; **6** : 191

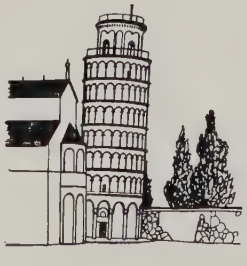
Istanbul, formerly Constantinople, a city in the European region of TURKEY and once its capital. The population is over a million. **2** : *152*

Italy, a country of southern Europe which juts out into the Mediterranean, includes the islands of Sicily and Sardinia and many smaller ones. It has extensive agricultural resources, especially in cereals and fruits. The chief towns are Rome, Milan, Naples, Genoa. The chief river is the Po.

2 : *152–153*, 222

In the Middle Ages Italy was a collection of small states, ruled by harsh princes who often fought each other. Machiavelli, who lived from 1469 to 1527, wrote a book called *The Prince,* showing how a man in power could keep his power by ruthless means. In the 19th century, some of the states in northern Italy were under Austrian rule. The Italians revolted, a famous figure in this revolt being Garibaldi, who led a column of volunteers and proclaimed Victor Emmanuel as king of a free and united Italy.

The Middle Ages in Italy produced many fine buildings.



The Leaning Tower of Pisa leans over because of earthquake disturbances yet it has not fallen. This period of Italian history was rich in painters, and poets, too, and gave rise to an interest in beautiful things throughout Europe. See RENAISSANCE.

Ivan the Terrible, see RUSSIA.

J

Jacobites, the name given to the supporters of James STUART, son of James II. The name for James in Latin is Jacobus. The Stuart cause was lost when Bonnie Prince Charlie was defeated at Culloden in 1745.

3 : 223–225, *232*

jaguar, the largest member of the CAT family in North and South America. **1** : *32*

Jamaica, an island in the West Indies, famous for its sugar plantations. **2** : 324, *331*

James I of England, and VI of Scotland, the son of Mary Queen of Scots, the cousin of Queen Elizabeth I. He was King of Scotland when, on the death of Elizabeth, he acceded to the throne of England as well, thus uniting the two kingdoms. He reigned as King of England and Scotland from 1603 to 1625.

3 : 122, 196–197, 211, 224, 343

One of the most famous men who flourished during the reign of James I was Francis Bacon, who was Lord Chancellor, a statesman, essayist and scientist. He lived from 1561 to 1626.

James II, the brother of Charles II, the last Roman Catholic king of England. He wished to free both Catholics and Non-Conformists from the harsh laws under which they suffered, but he aroused the fears of parliament and of members of the Church of England, who invited William of Orange to take the throne. James fled to France. He reigned from 1685 to 1689.

3 : 126, 224, 343

Jameson, Dr. Leander Starr, led a force of British into the Boer Transvaal, a raid which was not supported by the British government. The raiders were defeated, and Jameson was imprisoned by the British. He lived from 1853 to 1917. **3** : 335

Japan, a country of the Far East consisting of several islands,

with poor soil, mountain scenery and a large population of 83 million to feed. The farmers grow rice, tea, and cotton ; and silk is produced from silkworms fed on mulberry leaves. The Japanese are modern in outlook and manufacture many cheap and ingenious articles. But they have to import most of their raw materials. They use electricity made from water-power, as they lack coal. Tokyo is the capital, Osaka the chief manufacturing centre and Yokohama the chief port of Japan.

2 : 251–255, *259*

jazz, music of the popular dance hall which came to Europe from the American Negroes early in this century. It is often loud, noisy, lively, and jolly or sentimentally sad.

5 : 254

Jefferson, Thomas, American statesman who drafted the Declaration of Independence and was President of the United States from 1801 to 1809. He lived from 1743 to 1826.

3 : 259

jelly-fish, sea animals without backbones. They belong to

the group of INVERTEBRATES, which includes corals and sea-anemones. The body is a mass of transparent jelly, with a hollow central cavity that serves as a stomach. The mouth is on the underside, and from it grow four or more thick tentacles with stinging cells at the end.

1 : *19*, 275

Jenner, Edward, the English doctor who discovered vaccination as a protection against smallpox, a dreaded disease of the past. He lived from 1749 to 1823. **3** : 381

jerboa, a kangaroo-like RODENT, found in the hot deserts or plains of Africa and Asia. It has very long hind legs and moves about in a series of long leaps. The tail is used to help it balance. Its close relative, the jerboa rat, is found in Australia.

1 : *41*

Jersey cattle, a breed of dairy cattle which came originally from the Channel Islands. They are somewhat similar to GUERNSEY CATTLE but are smaller, with short horns. They vary in colour but are usually orange brown with occasional white patches. Their milk is rich and abundant, and the resulting butter is excellent. **1** : 359

Jerusalem, the chief city of Palestine, known to Jews, Christians and Moslems alike as the Holy City. The Old City is populated chiefly by Arabs, and the New City, which became the capital of ISRAEL in 1949, is populated chiefly by Jews.

6 : 191, 198, 201–202

Jesus Christ, the founder of Christianity. The name means "Saviour sent from God," that is, the one sent by God to save men from the power of evil. He taught people that God is the Father who loves all men, and by the example of His own life, He showed mankind that it was possible for human beings to live a life of perfect fellowship with God. As a teacher He made His points by means of simple stories called parables, which anyone can understand. We learn about His life and teachings and His miracles, or marvellous works, from the four accounts by Matthew, Mark, Luke and John in the New Testament. See BIBLE.

6 : 191–210, *193–194*, *211* ; **3** : 26–27

The most important parts of His story are the account of His birth (**6** : 191–192, *193*) now celebrated every year at Christmas ; His years of teaching and healing the sick (**6** : 196–198) ; His preparations for His work through His Church by the choosing of apostles to spread His message throughout the earth (**6** : 195–196) ; His trial and crucifixion (**6** : 198–201) ; His resurrection when He showed Himself alive before witnesses after His crucifixion, and His ascension into Heaven (**6** : 201–203).

All dates are reckoned as so many years "before Christ" (B.C.) or "from the year of Our Lord" (Anno Domini or A.D.).

jet engine, an engine devised to make a stream of gas in such a way as to be itself pushed like a rocket in the opposite direction. An aeroplane so equipped is a jet plane.

4 : 117, *122–123*

Jews, the people whose first home was Palestine. Their story is told in the Old Testament of the BIBLE. Their country was invaded many times and they were forced to scatter to different countries. From time to time throughout history they have been subjected to much persecution, notably in Germany under Hitler. Many of them have now returned to live in that part of Palestine which forms the State of ISRAEL.

2 : 190 ; **3** : 352–353 ; **6** : 191–192, 199–200, 205

jigsaw puzzle, a picture pasted on to thin cardboard or wood, and cut up into pieces of irregular shape that can be fitted together again. You can make your own puzzle by tracing and colouring pictures from these books. **1** : 111

Joan of Arc, St., a French peasant girl who, believing

herself to be instructed by God, managed to inspire French arms to victory at a time when they had been brought low. Although she herself was sold to the English foe, tried by the Church as a sorcerer and put to death, her influence lived on until the French succeeded in regaining their land. She lived from 1412 to 1431. **3** : 142–144

John the Baptist, son of Zacharias the Priest and the prophet of the coming of Christ.

It was John who baptised JESUS. **6** : 191, 195

John, king of England, agreed to MAGNA CARTA in 1215. He reigned from 1199 to 1216. **3** : 114, 342

John o' Groats, the most north-easterly point of Great Britain, the most south-westerly point being Land's End, in Cornwall. **2** : *150*

Johnson, Samuel, an English critic of literature and man of letters who wrote one of the best and earliest of dictionaries. He was a great character and good talker, and has been immortalized in his friend BOSWELL'S *Life of Samuel Johnson.* He lived from 1709 to 1784. **3** : 239

joint, two or more separate BONES in the body, joined in such a way that they can move easily. There are two kinds of joint, hinge joints and ball-and-socket joints. **1** : 373–375

Jolly Roger, traditional pirate flag with skull and crossbones as its design. **6** : *371*

Jonson, Ben, a contemporary and brother playwright of William Shakespeare, he wrote

mainly satirical comedies in prose such as *The Alchemist* and *Volpone the Fox.* He lived from 1572 to 1637. **5** : 91

Jordan, a country of south-west Asia north of Saudi Arabia. It includes a part of PALESTINE. Amman is the capital. **2** : *158–159*

Joseph of Arimathea, a friend of JESUS who sought permission to bury His body in his own tomb. **6** : 201

Judas Iscariot, one of the twelve disciples of Jesus. He finally betrayed Jesus to the chief priests of the Jews, leading their soldiers to the Garden of Gethsemane and indicating Jesus by kissing him. For this he received a reward of thirty pieces of silver. After Jesus's arrest he repented, and hanged himself. **6** : 196, 198–199

judo, a Japanese form of wrestling in which, by the supple yielding of the body, one's opponent's strength is often used to bring about his own downfall. **6** : 255

jumping, see ATHLETICS.

jungle, a tropical region of very dense forest with rampant undergrowth, huge creepers, and trees at different levels, and teeming with living creatures. **2** : 16–24

junk, a Chinese square-sailed

trading vessel. **4** : 208

Juno, the chief Roman goddess and wife of JUPITER. **5** : 9, 11

Jupiter, the planet, see SOLAR SYSTEM.

Jupiter, the Roman counterpart of the Greek god ZEUS, was the god of the starry heavens. **5** : 9

jury. When serious crimes are committed the suspected persons are tried before a judge and a jury, composed of twelve ordinary people. The judge guides the jury, explaining to them the rules by which they should consider the evidence (see TRIAL). But it is the jury that must decide whether the prisoner is guilty or innocent. If the prisoner is declared guilty, the judge then states what the punishment is to be, according to the law. **3** : 375–376

justice, the idea that wrongdoers should be punished by the community. For justice to be done there must first be wise LAWS made by the PARLIAMENT or ruler of a country; then there must be an efficient POLICE force to capture those who break the laws; finally, there must be a fair TRIAL of the accused person. **3** : 284–287

juvenile courts, see MAGISTRATES' COURTS.

K

Kaiser, see GERMANY.

Kalahari, a large semi-DESERT region in south-west Africa. **2** : *154*

kale, a curly-leaved, hardy plant of the cabbage family. **1** : 336, 338, 355

kaleidoscope, a device which makes a coloured pattern out of any simple fragmentary shapes by reflecting them and their reflections in mirrors. **4** : 325

kangaroo, a large Australian pouched MAMMAL with long hind legs with which it bounds over the plain, using its thick tapering tail as a rudder and support. **1** : *60*, 61–63

The tree kangaroo (**1** : 63), a smaller creature, can climb trees and lives off fruit.

Karachi, a seaport of PAKISTAN. An important link in sea and air communications, its population is over a million. **2** : *158*, 234

katydid, a long-horned GRASSHOPPER or tree locust of North America. There are many kinds of katydids, and they vary in colour, but most of them are bright green. They are most active at night, and the male makes the chirruping sound by rubbing his wings together. **1** : 207

kayak, an Eskimo canoe. **4** : 208; **2** : 62

Kenya, a British Colony in East Africa yielding varied agricultural products especially tea, sugar, cotton and sisal. The chief towns are Nairobi, the capital, and Mombasa. **2** : *154–155*

kestrel, see FALCON.

Kew Gardens, the famous botanical gardens near London which contain examples of plants, shrubs and trees from all over the world. **3** : 329

Khartoum, capital of the SUDAN, situated in the centre of the country at the junction of the Blue Nile and White Nile. **2** : 28, *37*, *154*

Khyber Pass, see AFGHANISTAN.

kidney, an organ of the body through which the BLOOD passes. Here it loses the waste chemical products left over after digestion, and this waste is carried as a fluid, urine, to the bladder, and so passed out of the body. There are a pair of kidneys in the human body, bean-shaped and found near the spine, in the lower part of the back.
1 : 370–371

king, the man who reigns in a monarchy. Britain has had many kings, but at the moment a QUEEN sits on the throne. The kings and queens of Britain from the time of William I are shown on the pages given.
3 : 342–343

king snake, a North American snake that lives on other snakes. **1** : 129

Kingsley, Charles, a Victorian clergyman, the novelist who wrote *Westward Ho!*, a romance of the Elizabethan sea-dogs, and *The Water Babies* for young children. He lived from 1819 to 1875. **5** : 60

Kipling, Rudyard, the great exponent of the idea of Empire. An English writer and poet, born in Bombay, he wrote hundreds of short stories which made the life of the British in India wonderfully vivid to the people at home. His *Jungle Books* and *Just So Stories* are beloved of children. He lived from 1865 to 1936.
5 : 32–33, 70–71

Kitchener, Horatio Herbert, Earl Kitchener of Khartoum, a British soldier. He led the army which conquered the Sudan and became commander-in-chief of the British army in the Boer War. He was Secretary of State for War in 1914, but lost his life in 1916 when the warship on which he was travelling to Russia struck a mine. **3** : 344

kite, a device consisting of a light framework covered with paper, etc., which gets blown up into the air when drawn against the wind at the end of a string. The Chinese are particularly fond of kite-flying, often making them in the shape of birds and

dragons. Children can make their own kites and fly them as a hobby. **5** : *286*, 338–339

kittiwake, a beautiful type of GULL, with three toes. It gets its name from its peculiar cry.
1 : *108*

kiwi, a small flightless bird, found only in New Zealand. It

eats worms and insects for which it probes the ground at night with its long curved beak.
1 : *118*, 124; **3** : 315

knee, the joint between the thigh and the lower bones of the leg. It is protected by the knee-cap. **1** : 373

knighthood, in the Middle Ages, an ideal combining service, power, bravery and skill at arms. Knights were given land by a prince or lord in return for military service to be given at need by themselves and their followers. **3** : 107–108

Knights of St. John, see ST. JOHN AMBULANCE BRIGADE.

Knight Templar, a medieval soldier-monk. **3** : 89

knot, the unit of measurement of speed at sea. **2** : 145

Knox, John, a Scottish protestant reformer, who strongly opposed MARY QUEEN OF SCOTS. He was largely responsible for establishing the Presbyterian Church as the official church of Scotland. The government of this church is carried on by presbyteries, or committees of elders, not by bishops. He lived from 1505 to 1572. **3** : 176

koala, a tree-climbing pouched MAMMAL of Australia. Although it is known as the "native bear" it is not a member of the bear family, but belongs to the group of PHALANGERS. The baby koala is kept in its mother's pouch for the first six months of its life, but after that it is carried about on her back. Koalas live on the leaves of eucalyptus trees and the blue gum tree. **1** : *60*, 63–64

Komodo dragon, see LIZARD.

Koran, see MOHAMMED.

Kremlin, the ancient fortress in Moscow used today as government offices. **2** : 244

Kruger, Paul, four times President of the South African Republic and commander of the Boer forces in the war against Britain. He lived from 1825 to 1904. **3** : 335

L

laburnum, a poisonous shrub or small tree, with hanging clusters of yellow flowers.
1 : 249

lacrosse, a Red Indian game in origin, played by teams of twelve with curved sticks having a network of thongs in the curve.
6 : *255*

ladybird, see BEETLE.

Lafayette, Marquis de, see UNITED STATES OF AMERICA.

lagoon, the sea-lake contained within a CORAL island.
2 : 80–82

lake, a piece of water surrounded by land. The Great Lakes situated between Canada and U.S.A. are as big as seas, Lake Superior being the largest lake in the world. **2** : 98–99

lake-dwellings, prehistoric houses, often a whole village, built on piles in a shallow lake for safety from attack.
5 : 186–190

lamb, a young sheep. Lambs are born early in the year. See also SHEEP. **1** : 313, 338–340, 350–352, 357

Lang, Andrew, a Scottish man of letters best known to children for his many collections of fairy-tales and folk-tales. He lived from 1844 to 1912. **5** : 28

Langton, Archbishop Stephen, see MAGNA CARTA.

language, the means by which we make our thoughts known to other people, either by speaking or writing. **4** : 9–12

People do not speak the same language all over the world, and this is a hindrance if people from one part of the world wish to understand people from another part of the world. In the Bible we read of the building of the Tower of Babel, which had to stop because the men building it spoke different languages and so could not work together. There are hundreds of different languages used throughout the world, yet we can detect likenesses between certain languages, and so speak of families of languages. Thus, English is similar to German, Danish, Norwegian and Swedish. French is similar to Italian, Spanish, Portuguese and Rumanian. Russian is similar to Polish, Czech and Bulgarian. To understand a language, you must know its words and their meanings, known as vocabulary, and the way the words are fitted together to make sentences, known as GRAMMAR.

lantern, an oil lamp or candle placed in a glass and metal frame to protect it from the wind. **4** : 306

Lao-Tze, the Chinese religious teacher who founded Taoism, a mystical religion which taught man to seek the way of the Universe and to be passive rather than active. He lived from about 605 to 524 B.C. **6** : *408*

Laplanders, or Lapps, a wandering people who live in the TUNDRA of north Europe,

herding reindeer for their meat and milk. **1** : 320 ; **2** : *56*, 57

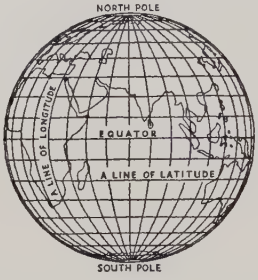
larva, the first stage in the development of certain animals which are quite different in appearance and habits from the adult, and which go through a change of form called METAMORPHOSIS. For example, the CATERPILLAR is the larva of the butterfly. GRUBS and maggots also are larvae. **1** : 189–196, 199–200

latex, the sap of the RUBBER tree. **4** : *272*, 273–274

lathe, a machine for shaping wooden articles. **4** : 249

Latimer, Bishop, see REFORMATION.

latitude and longitude, lines which make it possible to find our position anywhere in the world and so are essential to



NAVIGATION. Lines of longitude run from pole to pole. Lines of latitude run parallel to the equator. **2** : 140, *141–142*,; **4** : 212–213

laurel, an EVERGREEN tree with smooth stiff leaves. In olden days these were used as crowns for heroes. **1** : 249

Lavoisier, Antoine Laurent, French founder of modern chemistry. He lived from 1743 to 1794. **4** : 46

law, the system of regulations which people allow their governments to make so that they may enjoy an orderly life. Imagine a highway without "the rules of the road" ; so, too, in our community, we cannot each be a law unto himself without chaos resulting. Even in the most primitive society laws come into being because they are necessary. **3** : 284–288

lawn tennis, a game for two or four players in which a cloth-covered, rubber ball is driven back and forth across a net by means of rackets—bats made of catgut stretched tightly across an oval frame of wood. The outdoor court on which it is usually played is of grass or, more often, of stone-like chips finely ground and rolled smooth. **6** : 263–269

Lazarus, the brother of Martha and Mary, friends of Jesus. We are told that Jesus caused Lazarus to rise from the dead. **6** : 204

leaf, the chief breathing-organ and the food factory of a plant. All living parts of a plant breathe by taking in oxygen and giving out carbon dioxide through tiny breathing-pores, or stomata. This process is called RESPIRATION, but the leaves carry out this part of their work only at night. During the day they are busy building up food by the process of PHOTOSYNTHESIS, during which they take in carbon dioxide and give out oxygen. The plant also gets rid of the water it does not need through the breathing-pores of the leaves. This is called TRANSPIRATION. See also TREES. **1** : 12, *227*, 228–229

leaf-cutting ant, see ANT.

leaf-insects, insects belonging to the same group as grasshoppers, locusts, crickets and stick insects. The body and legs are flattened, and in colour and shape they look just like the leaves amongst which they live. This helps them to avoid detection by their enemies. See also CAMOUFLAGE. **1** : 205, 292, *293*, 298

leaf-miner, see INSECT PESTS.

leafprints, a hobby which combines an interest in nature with printing in colour. **5** : 310–311 ; **1** : 261

leaf skeleton, the framework of veins left behind when the green part of the leaf has been removed. **5** : *308*, 309–310

League of Nations, formed at the end of World War I, the first attempt of the nations to make an organization to prevent war. Germany and her allies and Russia, however, were not at first allowed to join, and America refused, so the League was never a league of the nations of the world. America's refusal to join the League was a great disappointment, as Woodrow Wilson, the American President, had been one of its keenest supporters. **3** : 351

leather, a tough material made from the hides of cattle, etc., and used for making shoes, bags, belts and dozens of other articles. **4** : 318–321

leather-jacket, the grub of the crane-fly or daddy-long-legs, a common garden INSECT PEST. **1** : 202

leek, a vegetable similar to the onion, and the emblem of Wales. **3** : 39

legend, see MYTHS AND LEGENDS.

Leghorn, a rather small breed of hardy domestic fowl, originally from Italy. They are valued for their excellent laying qualities. They all have smooth yellow legs and white ear lobes, but their plumage differs according to the variety. **1** : 360

lemming, a small RODENT about the size of a rat. Lemmings are found in the mountain regions of Canada, Greenland and Norway, and live together in large colonies. Their numbers increase at a great rate, until the time comes when there is not enough food for them all. Then great swarms of them leave their burrows and march across the countryside in search of food. They destroy all crops in their path, and continue their journey even as far as the sea, where many of them drown. This is not a true MIGRATION, for those which survive do not return to their former homes. **1** : 304

Lenin, Vladimir Ilyich Ulyanov, the leader of the Communist party which seized power in Russia after the Revolution. He lived from 1870 to 1924. **3** : 352

lens, a piece of glass in which both sides are curved. A lens can be concave, thin in the middle ; or convex, thick in the middle. Both types cause light rays to bend. **4** : 327–328

Leoncavallo, Ruggiero, Italian composer who lived from 1858 to 1919. His one great work is the opera *I Pagliacci.* **5** : 252

leopard, or panther, a dangerous member of the CAT family, found in Africa, India and China. It is smaller than the lion or tiger, but more cunning and can climb trees. It varies in colour from pale yellow to black, marked with black spots. It hunts at night for antelopes, wild pigs and other similar prey. **1** : *32*, 33–34

letter-writing, an art with its own rules, set out in this book. Those who know the rules and obey them are readily seen to be both good-mannered and well taught. Those who don't are at once seen to be uneducated or bad-mannered or both. **6** : 158–159

lever, often a device for helping you to move a heavy

weight. It is the basis of many tools. A spade is a lever for moving lumps of earth. **4** : 22–23

lichen, a form of plant life in which two different kinds of plant have combined to help each other. One is an ALGA which contains chlorophyll, the other is a FUNGUS. A lichen has no true stem or leaves, but as a result of this partnership it can live on rocks or the bark of trees or in ground where other plants could not thrive. In one form it is known as reindeer moss, since reindeer feed on it. **1** : 303

lift, a cage which travels vertically up and down in a shaft. Usually the weight of the lift is balanced by a counterweight. **4** : 227

light, a form of radiant energy. **4** : 322–357, *339*

Light travels at over 186,000 miles per second, and can be bent when passed through a LENS (**4** : 326–331).

In a room sealed off from light we see nothing, so it is light that enables us to "see." We see things when light is reflected from them, and so all COLOURS are dependent on light (**4** : *339*). Although a little light comes to us from the stars, SUNLIGHT is the great source of useful light in our world. See REFLECTION and REFRACTION.

lighter, a contrivance for making a flame. Usually it has a flint which, when struck by a wheel, gives off a spark, setting light to a wick containing an inflammable fuel. **4** : 18

lighthouse, a tower on a dangerous coast which flashes a warning light to ships at sea. **4** : 211–212

lighting, the variety of means that man has devised to increase the hours during which he can see. For hundreds of years he used oil lamps or candles. The 19th century gave us gas lighting, and the 20th electric. **4** : 306–313, *311*

Special forms of modern lighting are fluorescent lighting (**4** : 309), flood-lighting and searchlights (**4** : 310), while glass tubes filled with neon gas which glow when an electric current passes through them are much used in advertising (**4** : *311*), and are called neon signs.

lightning, the discharge of electricity from cloud to cloud or cloud to earth. **4** : 145

light-ship, a ship which is moored near a danger spot to

act as a warning to ships at sea. **4** : *197*, 212

Light Sussex, an English breed of domestic fowl, noted both for its tender flesh and good flavour as a table bird, and for good egg-production. **1** : 360

light year, the distance travelled by light in a year, the unit of linear measurement used for astronomical distances which are so great as to be unwieldy in normal figures. A light year is six million million miles. **2** : 382

lilac, a favourite garden bush, bearing cone-shaped clusters of sweet-smelling pink or purple flowers. **1** : 248

Lilienthal, Otto, German air pioneer of the glider. He lived from 1848 to 1896. See also FLIGHT PIONEERS and GLIDING. **4** : *231*, 233

lily, one of the flowering plants that can be grown from BULBS, and are cultivated in a garden for their strikingly beautiful flowers. There are over two hundred different kinds, and many varieties of these kinds. In the wild state they grow best where there is moisture in the air, as in river valleys, or mountainous districts. **1** : 231, *246*

lime, also called the linden tree. This stately tree is valued

for parks and large gardens. It has white, sweet-scented flowers, and bears fruit like a small greenish yellow lemon, whose juice makes a refreshing drink. **1** : 218, 364, 375

limestone, a porous rock originally formed of the compressed shells of myriads of tiny sea creatures. It contains much lime, and is used for building. **2** : 84–86, 102

limpet, see MOLLUSC.

Lincoln, Abraham, see UNITED STATES OF AMERICA.

linden, see LIME.

linen, a fine, thin cloth made from the fibres of the stems of the flax plant, much of which comes from Northern Ireland. **4** : 282–283

liner, a large sea-going vessel for carrying passengers, and belonging to a shipping line or company. **4** : 96, *198–199*, 202–205

lines of force, the pattern made by iron filings when they are scattered around a magnet. **4** : 139

lino-cuts, the art of making blocks with which to print pictures from pieces of linoleum, in which designs or pictures are cut with special tools. Linoleum happens to furnish an easy medium in which to cut pictures, and the lino-cut is a simple, bold and often very effective decoration. Lino-cutting is an interesting hobby for the boy or girl with artistic talent. **5** : 351–355

linseed, the seed of the flax, from which linseed oil is made. **2** : 200

lion, the boldest-looking member of the CAT family, it is second in size and weight only to the tiger. It is found in Africa. It formerly lived over a large part of Asia, but now the only lions found in Asia are a few hundred rigorously protected in the Gir Forest. The male has a mane, but the female, or lioness, has not. The lion usually hunts for food at night, its chief prey being zebras and

antelopes, and it is only rarely that it attacks human beings. **1** : *32*, 33

liquids, things which are neither gases nor solids. See CHANGES OF STATE. **4** : 43

Lisbon, a seaport and the capital of Portugal. The population of the city is over 800,000. **2** : *152*

Lister, Joseph, the British surgeon who learned from PASTEUR the importance of germs in causing infection and made operations much safer by the use of antiseptics. He lived from 1827 to 1912. **3** : 381

Liszt, Franz, a Hungarian musician and the greatest pianist of the last century. He was also a composer of note. Liszt was one of the great Romantics and his piano recitals were dramatic to watch as well as to hear. Perhaps best known of his works are his *Hungarian Rhapsodies*. He lived from 1811 to 1886. **5** : 236–237, 257

Livingstone, David, a Scottish medical missionary and explorer who discovered the VICTORIA FALLS and traced the Zambesi River. He worked in Africa for 30 years, helped only by a handful of native friends and followers, surviving attacks by lions and other wild beasts; and when lost to civilization was "found" again by the explorer and journalist, Henry Morton Stanley. Livingstone lived from 1813 to 1873. **3** : 321–323

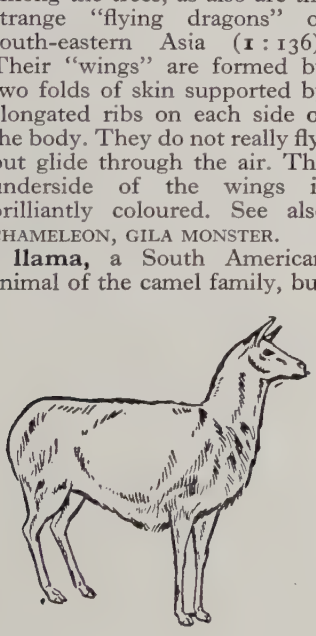
lizards, one of the group of REPTILES. They are cold-blooded and the body is covered

with scales. Most lizards lay eggs, but some produce living young. Their principal food consists of insects and spiders. There are nearly three thousand different kinds of lizard; they live on land but some are also very good swimmers. Some can glide through the air, some can climb trees and some can burrow underground. One of the strangest things about them is that they can grow a new tail if the original one is broken off or damaged. **1** : 15, 132–137, *136*, 278, 292

Only three kinds of lizard are found in Britain, the common lizard (**1** : 132–133), the slow-worm (**1** : 133) and the sand lizard (**1** : 133). The biggest and most brightly coloured lizards are most numerous in hot countries. The Komodo dragon of Indonesia (**1** : 132, *136*) is the biggest of all the lizards, and may grow to as much as twelve

feet in length. It belongs to the group of lizards known as monitors, which are found in Africa, Asia and Australia. The lace monitor, or goana (1 : 132) is well known in eastern Australia. It can climb trees very easily and causes great damage, for it eats small birds and their eggs, and also raids poultry runs. The frilled lizard (1 : 132) is another interesting Australian lizard. Its frill is a collar of loose skin round the neck, and is joined to bones in the throat. When the lizard is frightened or enraged it opens its mouth wide and hisses, and as it does so, the muscles stretch the frill and cause it to expand like an open umbrella. It is intended to frighten away enemies, and it does. This lizard runs on its hind legs, as does the basilisk (1 : 134, 136), a member of the iguana family (1 : 134, 136). Only the male basilisk has a crest along its back. Both these lizards are perfectly at home among the trees, as also are the strange "flying dragons" of south-eastern Asia (1 : 136). Their "wings" are formed by two folds of skin supported by elongated ribs on each side of the body. They do not really fly, but glide through the air. The underside of the wings is brilliantly coloured. See also CHAMELEON, GILA MONSTER.

llama, a South American animal of the camel family, but



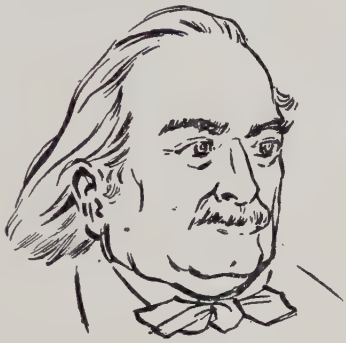
without a hump. It has been raised for many years in the Andes for use as a beast of burden and for its wool.

1 : 303, 315, 320, *322*

Llewelyn ap Gruffydd, Prince, hero of the Welsh people and grandson of Prince Llewelyn the Great. He carried on his grandfather's struggle against the English for Welsh independence, fighting the forces of Henry III and Edward I. He was killed in 1281.

3 : 117–118

Lloyd-George, David, came of a poor Welsh family. He was



a solicitor and became Chancellor of the Exchequer, whereupon he introduced a system of national insurance. He became Prime Minister during WORLD WAR I and took a leading part in the peace talks at the end. He lived from 1863 to 1945.

3 : 344

Lobengula, the Zulu King of Matabeleland in Southern Africa who was defeated by the British in the Matabele War. He lived from 1832 to 1894.

3 : 334–335

lobster, see CRUSTACEAN.

lock, a canal, a means by which ships can be made to float from a lower to a higher (or a higher to a lower) level.

4 : *84,* 85–86, 193–194

locomotive, an engine for pulling a TRAIN.

4 : 214–230, *220–221*

locospotting, the hobby of studying railway engines and recording their numbers.

5 : 301

locust, a variety of GRASSHOPPER. In the tropics swarms of locusts sometimes take flight. Wherever the swarm alights they eat every living plant, causing great damage to crops in a short space of time.

1 : 206

locust tree, or false acacia, an American tree whose very hard wood is used for posts, canes, etc. It has feather-like leaves, and drooping spikes of handsome, scented white flowers.

1 : 249

lodestone, a type of rock containing a great deal of iron. Being magnetic it was once used as a primitive COMPASS.

4 : 135

Lofting, Hugh, the author of the *Dr. Dolittle* books for children. He lived from 1886 to 1947.

5 : 71

Lollards, followers of John WYCLIFFE. They lived a life of poverty and went about the country preaching. Their movement was persecuted and declined, but survived until the Reformation.

3 : 203–204 ; 5 : 41

London, the capital of the UNITED KINGDOM and a main centre of the world's commerce and industry. The population, including Greater London, is more than 8 millions.

2 : *55, 147–149,* 352–354

London, Jack, an American writer of adventure novels including *The Call of the Wild* and *White Fang.* He lived from 1876 to 1916.

5 : 32, 67

longitude, see LATITUDE AND LONGITUDE.

loom, a machine for weaving cloth from threads.

4 : 287

loose-box, part of a stable where horses are kept untied.

1 : 332

Lord High Chancellor, the member of the House of Lords who acts as its chairman. He is responsible for advising on the appointment of judges and is a member of the judicial body of the House of Lords which acts as the final court of appeal in Britain.

3 : 373

Lords, a cricket ground, headquarters of the Marylebone Cricket Club (M.C.C.) and home ground of Middlesex County Cricket Club.

6 : 234

Lords, House of, see PARLIAMENT.

Lord's Prayer, the prayer which JESUS taught his disciples to say.

6 : 207

Louis XIV, a 17th-century King of France who ruined his country by aggressive wars but furthered learning and

the arts. He was very fond of dancing and created the first great BALLET school, the Royal Academy of the Dance.
5 : 265–266

Louis XVI, King of France at the time of the French Revolution. He was beheaded together with his wife, Marie Antoinette. 3 : 270–271

lucerne, a clover-like plant which is valuable for food for cattle. 1 : 329

lumbering, the business of cutting down forests to procure their TIMBER. 2 : 52, 180, 262

lungs, two bag-like organs which in man's body are found in the chest. They are the breathing organs, and the blood flowing through their walls takes up oxygen from the air and gives off carbon dioxide. See RESPIRATION.
1 : 366–367, 370–371, 374

lungfish, a kind of fish found in the rivers and marshes of tropical Africa, in the Amazon basin, and in a few rivers in Australia. It has LUNGS as well as GILLS for breathing. In times of drought it burrows into the mud and sleeps until the water floods back, when it can use its gills once more. In stagnant waters, it will come to the surface and gulp air. 1 : 277

Luther, Martin, a German friar whose protests against the

sale of indulgences led to the Protestant REFORMATION. He lived from 1483 to 1546.
3 : 160–161

lyre, the ancestor of the HARP, played in ancient Assyria and Greece. 5 : 221

lyre-bird, a very beautiful bird found in Australia. When the male is displaying, its tail feathers curve upwards into the shape of a lyre. It is an excellent mimic of other birds' calls.
1 : *117*, 122

M

Macaulay, Thomas Babington, Lord, English historian and essayist, brought to literature the gifts of an orator and debater and used them often on behalf of unpopular causes like the welfare of the people of India. He is best known to children as the poet of *The Lays of Ancient Rome*. He lived from 1800 to 1859. 5 : 99–100

macaw, a large PARROT with a long tail and brightly coloured feathers. It has a harsh voice, and comes from Central and South America. 1 : *117*, 121, 124

Macdonald, Flora, helped Bonnie Prince Charlie to escape to the Continent after his rebellion. She lived from 1722 to 1790. See also JACOBITES.
3 : 225

Macedonia, see GREEKS.

Machiavelli, see ITALY.

Macintosh, Charles, the inventor of the process of rubberizing cloth, which results in the mackintosh or waterproof. See also RUBBER. He lived from 1766 to 1843. 4 : 276–277

Madrid, the capital of Spain. The population is over 1½ millions. 2 : *152*, 228–229

madrigal, a song for three or more unaccompanied voices, in which each voice has a complete melody to itself. It was a very popular form of music in the Elizabethan age. 5 : 250

Magellan, Ferdinand, a Portuguese navigator, born 1470, died 1521. 3 : 167

magic lantern, an old invention by which pictures made on small glass slides can be magnified and projected on to a white screen—the cinema projector uses the same principle.
4 : 348–349

magistrates' courts, also called Police Courts, used for hearing the less important kinds of case. Juvenile Courts for dealing with young offenders are a special kind of magistrates' court. See also ASSIZES, and TRIAL. 3 : 287, 375

Magna Carta, a document limiting the rights and power of the Crown which King JOHN

was forced to agree to at Runnymede in 1215 by the nobility headed by their spokesman, Stephen Langton, Archbishop of Canterbury. 3 : 114, *115*

magnet, a piece of iron or steel having the power to attract scraps of similar metal held nearby. 4 : 135–145

When hung by a thread, one end will swing round until it points roughly towards the North Pole, a fact which gives us the magnetic COMPASS (4 : 137), for finding our way about. With one magnet you can make others (4 : 137). The earth itself is a sort of huge magnet, points near to the North and South Poles being its ends (4 : *134*, 135, 140–143). Many experiments can be done with magnets (4 : 135–145). Magnetism is connected with electricity (4 : 145). See ELECTRO-MAGNET.

magnetism, see MAGNET.

magnifying glass, a convex LENS, which makes things look bigger. 4 : 328

magnolia, an attractive tree, which has strong-scented waxy, cup-shaped flowers. Some varieties flower before the leaves appear. 1 : 249

magpie, a prettily marked

black and white bird of the CROW family. 1 : *96*, 100–101

mail, see POSTAL SERVICE.

mail train, a special train in which letters can be sorted out by post-office workers while

being carried to distant parts of the country. See also POSTAL SERVICE. **4** : *169*, 167–171

Maillot, Aristide, French painter who turned to sculpture and became the main originator of the modern trend in sculpture. He lived from 1861 to 1944. **5** : 179

maize, or Indian CORN, a cereal grown extensively in America and Africa. **2** : 233

mallard, or common wild duck, a shy bird that nests early by inland lakes and rivers. In the breeding season the male, or drake, is distinguished by a glossy green head and neck and by its curled tail feathers. **1** : 102, 104, *105*

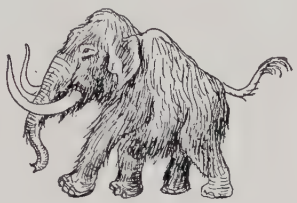
Malory, Sir Thomas, a knight of the Middle Ages who collected and re-told in prose the stories about the legendary

King ARTHUR and his Knights of the Round Table. His book, the *Morte d'Arthur*, forms the basis for later re-tellings by Spenser and Tennyson. He lived around 1470. **5** : 34

mammals, warm-blooded animals with backbones. They nearly all have fur, hair or wool, and, with two exceptions, they all have young that are born alive, instead of being hatched from eggs. The young are fed on milk provided by the mother. **1** : 14–15, *20*, 21–76, *30–32*, *41–42*, *59–60*, *77*, *284*, 285–288, 320

The exceptions are the echidna (**1** : 67–70) and the platypus (**1** : 70–71), both of which lay eggs, and both of which live in Australia. Also found in Australia are mammals that have pouches in which they carry their young to protect them while they are still too small to look after themselves. They include the BANDICOOT, FLYING PHALANGERS, KANGAROO, KOALA, WALLABY and WOMBAT (**1** : *60*, 61–67, 286). There are also mammals that live in the sea, such as SEALS and WHALES, and one kind of mammal lives in the air—that is the BAT.

mammoth, an extinct prehistoric animal slightly smaller



than the present-day elephants but with curving tusks. **1** : *284*, 287 ; **4** : 14–15

Manchester, a great inland port on the Mersey, and centre of the cotton spinning and textile industry. To bring big ships to the city, the Manchester Ship Canal was built in 1885. **2** : 287

mandrill, see BABOON.

mangold, a variety of beet cultivated as cattle food. It is also called mangel-wurzel. **1** : 338, 349, 352, 356–357

manor house, in the Middle Ages the home of the Lord of the Manor, around which were the cottages of the lord's retainers. **3** : 178–186, *264–5*

manure, any substance or fertilizer applied to the ground to enrich it and so make it more fruitful. Animal droppings, called dung, are commonly used for this purpose. **1** : 337, 346, 349–350

Maoris, the brown-skinned inhabitants of New Zealand, akin to the South Sea Islanders, and having a considerable degree of civilization before the arrival of white colonists. **2** : 178, 334–335 ; **3** : *314*, 316–317, 364

map, a drawing giving a plan of a region, showing the roads, railways, rivers, hills, cities, towns and villages and other useful information. Then there are special maps showing the vegetation of a region, or the populations, or rainfall, etc. **2** : *126*, 127–129

maple, a tree with hard, light-coloured wood, sweet sap and winged fruits. Its wood is often used in furniture and floors. Its leaf is the national emblem of Canada. **1** : 237 ; **2** : 327

Marathon, see GREEKS.

Marconi, Guglielmo, an Italian scientist, the first to make an instrument that could send long-distance radio messages. He lived from 1874 to 1937. See RADIO. **4** : 179

Marco Polo, a Venetian traveller who reached China and spent 25 years at the court of Kublai Khan. On his return he wrote a book about his travels. He lived from 1254 to 1323. **3** : 130–135, *133*

Mare, Walter de la, an English poet of recent times. Many of his poems were written for children. He lived from 1873 to 1956. **5** : 103

Marie Antoinette, the French queen hated by the revolutionaries for her extravagance. With her husband Louis XVI she was beheaded during the French Revolution. She lived from 1755 to 1793. **3** : 270–271

marmoset, see MONKEY.

marrow, the soft fatty tissue inside bones. **1** : 376

The name marrow is also applied to a variety of pumpkin cooked as a vegetable.

Marryat, Captain Frederick, an English novelist of the sea who wrote many stories of naval adventure in the 18th and early 19th century. Some of these, like *Masterman Ready*, *Mr. Midshipman Easy* and *Poor Jack*, have long been children's favourites. He lived from 1792 to 1848. **5** : 67

Mars, see SOLAR SYSTEM.

martin, a bird belonging to the same family as the swallow, and resembling it in flight and in its nesting habits. The house-martin lays four or five eggs, which hatch in fourteen or fifteen days. The nest is usually built under the eaves of a building. Sand-martins live together in colonies, making their nests in holes in the sides of sandy cliffs and quarries. The plumage is dark-brown on the upper parts with a brown band

across the breast. They do not have the distinctive white patch of the house-martins on the back. **1** : 88–89, 93

Mary Magdalene, one whom JESUS had befriended and who, when mourning His death, saw Him appear before her. **6** : 201

Mary, Mother of JESUS and wife of Joseph, the carpenter. **6** : 191–195

Mary I, daughter of Henry VIII. She became queen on the death of her brother, Edward VI. She was a Roman Catholic and tried to undo the REFORMATION by passing severe laws against the Protestants. She reigned from 1553 to 1558. **3** : 165–166, 197, 342

Mary II, daughter of James II and joint Sovereign with William III. She reigned from 1689 to 1694. **3** : 224, 343

Mary Queen of Scots, Queen of Scotland on the death of her father, James V. She married the King of France's heir, but returned to Scotland when he died. She was a devout Roman Catholic and at that time Scotland was in the midst of a Protestant REFORMATION movement. She married Lord Darnley, who was mysteriously murdered. She then married Lord Bothwell, who was suspected of having murdered Darnley. The country rose in rebellion, Mary was caught and forced to abdicate. She escaped to England but Elizabeth I kept her imprisoned. As a Roman Catholic, she was the centre of plots against Protestantism and having a claim on the English throne through her descent from Henry VII she was a constant menace to Queen Elizabeth, who at last agreed to her execution. She lived from 1542 to 1587. **3** : *2*, 175–178, *179*

Masai, a Negro people living in East Africa. They are divided into two classes : farmers and herdsmen ; and wanderers and hunters. They are all brave warriors. **1** : *312*, 316–317

Mascagni, Pietro, the Italian composer of the famous opera, *Cavalleria Rusticana*. He lived from 1863 to 1945. **5** : 231

Masefield, John, English poet-laureate, has the task of celebrating in his work events of national interest. He has written long narrative poems—almost novels in verse—such as *Reynard the Fox* (a good one to start with) and many novels of romantic adventure in which the sea plays a part. He was born in 1878. **5** : 102, 251

masque, a type of play developed in the 17th century in which music, dancing and singing take place and the characters tend to have an underlying meaning. **5** : 79, 88

matchbox labels, see COLLECTORS' HOBBIES.

mathematics, the science dealing with numbers and quantities. Most people start the study of mathematics by learning arithmetic. **6** : 130–140

There are other branches of mathematics. Algebra uses letters, such as *x*, *y*, etc., and gives a general formula instead of a precise answer as in arithmetic.

Geometry deals with lines, angles and figures of various kinds, such as the circle, triangle, and square. Known facts about them are used as a basis to prove other facts about them.

may bug, see BEETLE.

Mayflower, see PILGRIM FATHERS.

McAdam, John Loudon, famous Scottish road-surveyor who invented a new way of making roads. He lived from 1756 to 1836. **3** : 250

meadow saxifrage, a hairy-stemmed herb, with kidney-shaped leaves. The drooping white flowers are about one inch across. The plant is found in sandy fields and hedge-banks. **1** : 235

measuring, for distance, done in Britain by a scale divided into inches, feet, yards and miles. A foot is 12 inches long ; a yard, 36 inches long ; and a mile, 1,760 yards. **6** : 111

Liquid is measured by means of a scale which includes gills, pints, quarts and gallons. If you know what a pint bottle of milk looks like this will tell you the rest : you pour in 4 gills to fill your pint bottle, and you need 2 pint bottles to fill a quart. A gallon takes 4 quarts, that is, 8 pints or 32 gills. (**6** : 111)

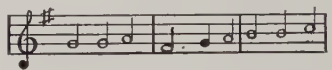
Mecca, see MOHAMMED.

Medes, see ANCIENT WORLD.

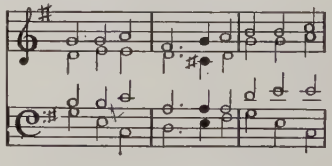
Mediterranean Sea, the inland sea separating southern Europe from Northern Africa. Around its shore grew up the first civilizations. See also ANCIENT WORLD, EGYPTIANS, GREEKS, ROMANS. **2** : *152–153*, 220–225

megaphone, a piece of metal or other stout material shaped like a funnel to increase the loudness of the voice. **4** : 372

melody, a continuous series of single sounds, of varying



pitch to form a tune as distinct from the combinations of two



or more sounds played together to form chords, which constitute harmony. **5** : 259

Melville, Herman, an American sailor-novelist whose *Moby Dick*, a story of hunting the whale, is one of the world's great sea stories. He lived from 1819 to 1891. **5** : 68–69

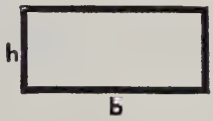
Member of Parliament, see PARLIAMENT.

Mendelssohn, Felix, a German composer of many talents

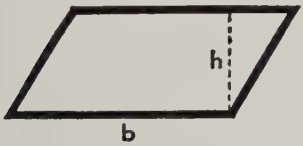
—for he was a conductor, pianist, painter, writer and chess-player. He enjoyed much popularity in Britain which inspired some of his best music such as the *Hebrides* overture, the music to *A Midsummer Night's Dream* and the *Scottish Symphony*. He wrote symphonies, concertos and many songs and piano pieces. He lived from 1809 to 1847. **5** : 231, 250

mensuration, the measurement of areas and volumes. **6** : 132–137

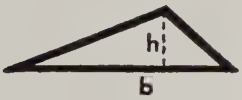
There are easy ways of calculating the area (that is, the size) of certain shapes. For example, the area of a square = the length of the side squared (multiplied by itself). That is, if one side of a square measures 2 inches, the area of the square = 4 square inches. Here are some other shapes and their areas.



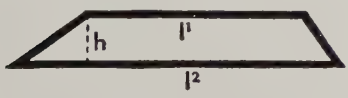
The area of a rectangle or oblong = base × height = bh.



The area of a parallelogram (a four-sided figure with opposite sides equal and parallel) = base × perpendicular height = bh.



The area of a triangle = $\frac{1}{2}$ base × height = $\frac{1}{2}bh$.

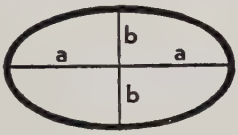


The area of a trapezium (a four-sided figure with only one pair of sides parallel) = $\frac{1}{2}$ the sum of the parallel sides × the distance between them = $\frac{1}{2}h$ $(l_1 + l_2)$.

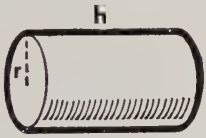
The area of a circle = *pi* × the radius squared = πr^2. *Pi* is the name of a letter of the Greek alphabet and is used in mathematics as a symbol to denote the proportion of the circumference to the diameter of a circle. This proportion works out at about $3\frac{1}{7}$. So π = about $3\frac{1}{7}$.

The area of a sphere (a ball or a globe) = $4\pi r^2$.

The volume of a sphere (the space included within its limits —always measured in *cubic* inches, feet, etc.) = $\frac{4}{3}\pi r^3$.



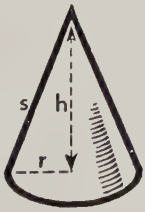
The area of an ellipse (a closed curve of an oval shape) = πab (where $2a$ and $2b$ are the lengths of major and minor axes).



The area of the curved surface of a cylinder = $2\pi rh$.

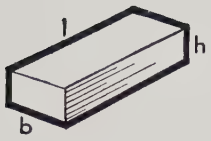
The volume of a cylinder = the area of the end × the height = $\pi r^2 h$.

The volume of a cube is the length of the edge cubed.

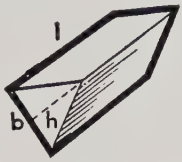


The volume of a cone = $\frac{1}{3}$ area of the base × the height = $\frac{1}{3}\pi r^2 h$.

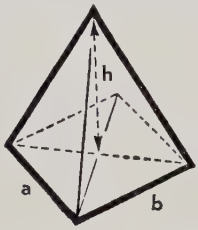
The area of the curved surface of a cone = $\frac{1}{2}$ the slant height × the circumference of the base = πrs.



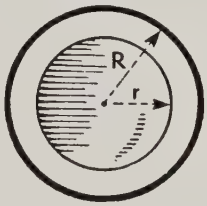
The volume of a rectangular prism = base × height × length = bhl.



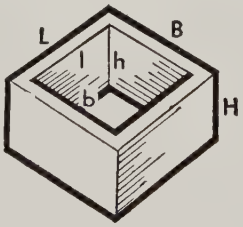
The volume of a triangular prism = the area of the end × the length = $\frac{1}{2}$ base × height × length = $\frac{1}{2}bhl$.



The volume of a pyramid = $\frac{1}{3}$ the area of the base × the height = $\frac{1}{3}abh$.



The volume of material in a hollow sphere = $\frac{4}{3}\pi$ $(R^3 - r^3)$ where R is the radius of the outside sphere and r the radius of the hollow inside.



The volume of material of an open box = the volume of the outside — the volume of the inside measurements = $BHL - bhl$.

meridian, a line of longitude. See LATITUDE AND LONGITUDE.

merlin, the smallest FALCON in Britain. Formerly they were trained to hunt and bring down GAME BIRDS. 1 : *106*, 114, 116

Mesopotamia, see ANCIENT WORLD.

metamorphosis, the change of form that occurs in insects and other animals which bear little resemblance to their parents in the early stages of their lives. In the BUTTERFLY, for example, a caterpillar, or LARVA, hatches from the egg. It feeds and grows, and as it gets bigger sheds its skin ; this happens several times. Then it turns into a pupa and rests, until the fully-grown perfect insect is ready to emerge. The tadpoles of the FROG and the nymph of the DRAGONFLY are other examples of this change of form. 1 : 149, 152, 209

Metcalf, John, "Blind Jack of Knaresborough," engineer and roadbuilder. He lived from 1717 to 1810. 3 : 250

Methodist, a member of the church founded by John Wesley. Originally "the Society of the people called Methodist," which Wesley formed from those who responded to his preaching in the religious revival of the 18th century, the Methodist church separated from the Church of England after his death. It spread through the world and is now the leading denomination in the U.S.A. and the third largest Protestant Church in the world. 3 : 247–249

metric system, the tables of weights and measures introduced by Napoleon and used by most countries in Europe. The unit of distance is a metre (about 1 yd.) ; small lengths are measured in centimetres (one-hundredth of a metre, and long distances in kilometres (one thousand metres). Similarly weights are measured in centigrams and kilograms. 3 : 318

Mexico, a country in NORTH AMERICA, south of the United States. A largely mountainous region containing many volcanic peaks, it is rich in mineral deposits, especially silver. The capital is Mexico City. 2 : *162–163*

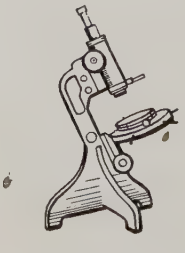
Mexico is the home of the ancient Aztecs. They were highly civilized people and founded a powerful empire, which crumpled up when the Spaniards under Cortez arrived in 1520. Their last emperor was Montezuma.

Michelangelo, an Italian, one of the greatest artists both as painter and sculptor. His figures always give an impression of size and majesty, and his

immense paintings on the ceiling of the Sistine Chapel in Rome form one of the chief religious treasures of the world. As architect, he re-designed St. Peter's Cathedral, Rome. He lived from 1475 to 1564. 5 : 130, 174–179

microphone, an instrument for picking up sounds and making them influence an electric current passing through. There is a microphone in a telephone mouthpiece and a microphone is needed when speech or music is to be broadcast. 4 : 182–183, 355

microscope, an instrument using LENSES to make very



small things visible, thus enabling us to study them. An electron microscope, however, is much more powerful, letting us see by means of electric rays instead of light waves. 4 : *330*, 331–332 ; 1 : 224–226

midnight sun, the strange effect in the Arctic Circle of continuous daylight in summer balanced by continuous night in winter. 2 : 59, 64

migration, the regular movement made by certain creatures from one place to another at certain seasons of the year. This is generally done to meet a food shortage. Some birds leave a country in winter and return regularly in summer, when food is more plentiful. See also EEL, SALMON. 1 : 300–301, 303–304

mildew, a small, thin, whitish growth, called a FUNGUS, which feeds on living matter. 1 : 264, 351

Milky Way, the part of our galaxy in which the stars are thickest. See also STARS. 2 : 376

Milne, A. A., a modern writer whose *Winnie the Pooh* has become a children's classic. His verses, *When We Were Very Young*, are nearly as famous. He lived from 1882 to 1954. 5 : 32

mimic, to imitate or copy very closely. Certain PARROTS, for instance, mimic human speech. See MIMICRY. 1 : 297, 304–305

mimicry, the way in which certain harmless animals gain protection from their enemies by their resemblance to other animals that are dangerous or unpleasant to eat. The bee hawk moth, for example, is left alone because it looks like a bumble bee. See also CAMOUFLAGE. 1 : *294*, 297–300

mineral, a natural substance which is neither vegetable nor animal. Although there are liquid minerals, such as water and mercury, most minerals are solids, like rocks. 1 : 364

Minerva, the Roman goddess of wisdom and of arts and crafts. 5 : 11

minuet, a slow and stately dance, popular during the 17th and 18th centuries. 5 : 253

mirror, a surface which reflects things. Early ones were made of polished metal ; modern ones of glass, the back of which has received a coating of silver paint. 4 : 323–325

pirates boarding a merchant ship

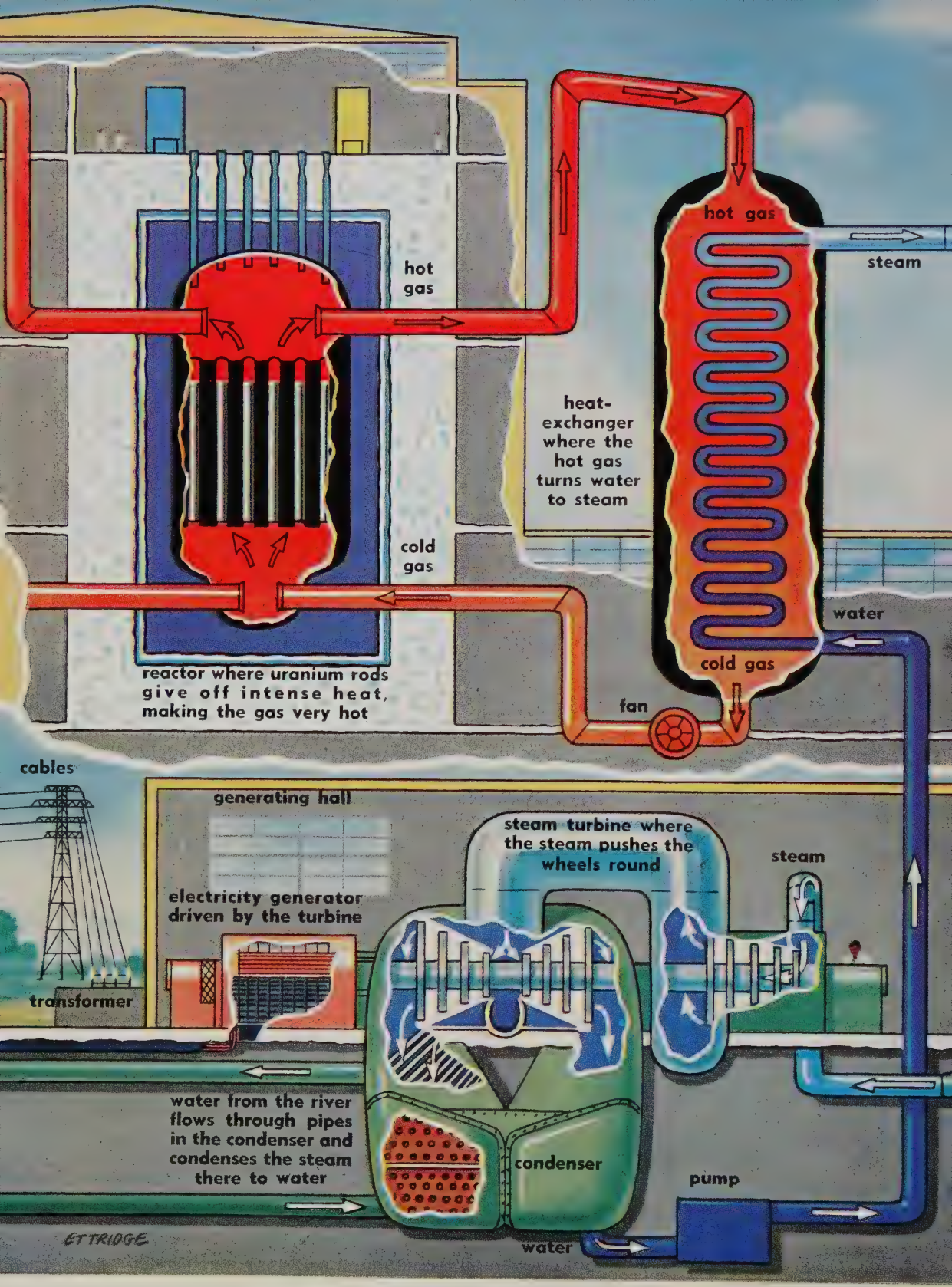
the Jolly Roger, the pirates' flag

the Spanish Main, the haunt of pirates

Blackbeard, a famous pirate

pirates burying stolen treasure on a desert isle

PIRATES USED TO BE VERY ACTIVE AROUND THE SPANISH MAIN



HOW ELECTRICITY IS GENERATED AT AN ATOMIC POWER STATION

Mississippi, a river in the central United States, which with its tributary, the Missouri, forms the longest river (4,500 miles long) in the world.
2 : *162*, 316

Mithras, see ROMANS.

moat, the defensive ditch surrounding a castle, over which a drawbridge could be lowered to let friends come in.
5 : 192, *193*

Behind the drawbridge an iron gate called a portcullis (**5** : 196) could be raised or lowered.

mobiles, one of the lighter arts. Figures such as birds, fishes, people, etc., are cut out of tin or other light flat material and tied to threads suspended from a framework of wires. Attached to the ceiling they tremble or flutter in lively fashion and form an amusing house decoration. **5** : 341

"Moby Dick," see MELVILLE.

Model Army, see CROMWELL.

model railways, the toy of our youth which often becomes a fascinating hobby as we grow older. **5** : 294–300, *298*

models to make, of historical subjects.
3 : 21–22, 42–44, 72, 91–92, 129, 150, 176–177, 183–184, 189, 196

Mohammed, born at Mecca, became the founder of the Moslem or Islamic religion of Arabia, Iraq, Persia, Syria, Pakistan and northern Africa. Moslems believe in a single God, called Allah, and in angels, judgment day, Paradise and Hell. There are no priests, but any male believer can lead the worship in a mosque, the Moslem church. The holy book of the Moslems is the Koran, which is the revelations to Mohammed by the Archangel Gabriel. **6** : 408

Mecca is the holy city of the Moslems and it is the ambition of every Moslem to make a pilgrimage there once in his lifetime. Several times a day all Moslems turn their face towards Mecca and kneel in prayer.

mole, a small burrowing MAMMAL which digs underground passages and chambers and lives on worms and insect pests. **1** : 53–54

mole-cricket, see CRICKET.

mollusc, a soft-bodied animal without a backbone, often with a protective shell, and possessing a muscular creeping foot. There are land molluscs such as the snail (with a shell) or slug (without a shell) and sea molluscs such as limpets, oysters and whelks. One branch of molluscs includes the CUTTLEFISH, OCTOPUS and SQUID.
1 : 17–18, 155–156, 159, 275

Some molluscs, such as the limpet, have only one shell, and are called UNIVALVES. Others, such as the oyster, have two shells hinged together and are known as BIVALVES.

monastery, the place in which a group of MONKS dwell and carry on their religious life.
3 : 111–113

money, usually notes and coins made by the Government and put into circulation by the banks. We accept money in exchange for our services or our goods and with it can buy other people's services and goods. Without money everything we did or made would have to be exchanged for other goods or services. This is called barter and is seldom convenient.
2 : 266–269 ; **6** : 109

Mongolia, an eastern country of Asia between China and Siberia. Its full name is the Mongolian People's Republic. The Gobi desert occupies the central and south-east regions. The capital is Ulan Bator.
2 : *158–159*

It was from this part of the world that there came the fierce Mongolian warriors of the Middle Ages. Under Genghis Khan they became masters of central Asia. To the east they over-ran China, and Kublai Khan, his grandson, ruled an immense and powerful empire. It was to the court of this emperor that Marco Polo came. Westwards the Mongols poured across southern Russia, reaching as far as Hungary and Poland before retiring, while central Russia came under the power of the Mongolians of the Golden Horde. To the south, Tamerlane led a Mongol army into India, destroying as he went, and a later invasion of Mongols created the Mogul dynasty which ruled over India.

mongoose, a small mammal found in great numbers in Africa and southern Asia. It feeds on rats, mice, lizards and

birds, and will even fight and kill poisonous snakes.
1 : 130

monk, a man who lives in a monastery and devotes himself to religion, giving up his possessions, refraining from marriage and obeying always the abbot or head of the monastery.
3 : 111–113

monkey, together with man and ape, belonging to the primate group of MAMMALS. Monkeys differ from the apes in being smaller, walking on all fours and having a tail which they often use as a fifth limb when leaping about in the tree-tops.
1 : 72–*77*

The so-called Barbary ape (**1** : 76, *77*) is a monkey, in spite of its name. It lives in North Africa and on the Rock of Gibraltar. The Diana monkey (**1** : *77*) makes quite an affectionate pet. It is distinguished by a white mark like a new moon on its forehead, and a little beard. The marmoset (**1** : 76, *77*) is the smallest of the American monkeys, no bigger than a rat. See also BABOON.

monsoon, a regular prevailing wind that reverses its direction from season to season, bringing with it a sharp change of weather. **2** : 233, 311

Montcalm, Marquis de, see WOLFE.

Montgolfier, Joseph and Etienne, two French brothers who made a balloon ascent into the sky by lighting a fire below it and so filling it with hot air.

Joseph lived from 1740 to 1810 and Etienne lived from 1745 to 1799. **4** : 230

Montgomery of Alamein, Viscount, a British field marshal, whose army defeated the Germans and Italians in North Africa, and later in Europe. **3** : 356

Montreal, the largest city in Canada on the St. Lawrence river, and main centre of commerce. The population is over a million. **2** : *162*, 330, 334

moon, the little world which circles the earth once a month while itself spinning round. Its diameter is only one quarter of that of the earth and it shines with the reflected light of the sun. Its seeming changes from a small crescent to full moon and back are called its phases. It is nearly a quarter of a million miles away from the earth. **2** : 358, 363, *367*, 383 ; **4** : *407*

Other planets have small bodies travelling round them. For example, Jupiter is known to have twelve such moons.

Moore, Henry, English sculptor who discards surface details in order to get at and represent in stone essential forms. He was born in 1898. **5** : 178, 180

moorhen, or water-hen, a British WATER BIRD about the size of a small hen. It has a scarlet and yellow bill, and is commonly seen on ponds. **1** : *95*, 103, *105*

moose, biggest of the DEER family, found in North America. Its European relative is called the elk. Much confusion is caused because the name "elk" is also used in America for another form of deer, the wapiti. **1** : 23–24

morality play, a play in which mankind is shown as beset by his vices and helped by his virtues, and all the characters represent some aspect of good or evil. See DRAMA. **5** : 78

More, Sir Thomas, Lord Chancellor under Henry VIII and the author of a famous book called *Utopia*. He refused to accept Henry as head of the Church in England, and was beheaded. He was canonized as a saint in 1935. **3** : 161

Morocco, a country on the north-west coast of AFRICA. Rabat is the capital, and the chief towns are Marrakech and Casablanca. **2** : *154–155*

Morris dance, a type of old English FOLK DANCING in which different characters are represented. **5** : 282

Morse code, an alphabet composed of dots and dashes, or short and long sounds on a buzzer. It was invented by Samuel Morse, who lived from 1791 to 1872, and is used in sending messages by telegraph and radio. **4** : 158, 160, 172, 180

"Morte d'Arthur," see ARTHUR.

mosaic, a decorative picture built up out of small coloured

tiles, stones or bits of glass which are stuck side by side to a floor or wall until the area is covered. **5** : 116–119 ; **3** : *19*, 23

Moscow, the capital of Russia and its largest city, with a population of over 4 millions. The Kremlin, an ancient citadel, is the seat of government. **2** : 244

Moses, the prophet who founded the Jewish religion and led his people, the Israelites, out of bondage from Egypt. He received on Mount Sinai the instructions of the Lord set forth as the Ten Commandments. To the Jews Moses was the great teacher and leader. He led them into the promised land as revealed to him by Jehovah. **6** : *408*

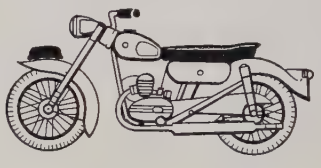
moss, a plant with small, leafy stems, growing in clumps on damp earth or BARK. It reproduces by means of SPORES. **1** : 250

Mosul, an old town on the River Tigris in Iraq. It is near a great region of oil wells. **2** : 40–43

moth, an insect which differs from a BUTTERFLY in having feather-like antennae, or feelers, and its wings, when at rest, fold horizontally, instead of vertically. Its body is generally stout and hairy, and it is usually most active at night. Both moths and butterflies develop from CATERPILLARS. **1** : *188*, 192–195, 199–200, 292, *294*, 299

"Mother Goose's Tales," see NURSERY RHYMES.

motor-bicycle, a two-wheel-



ed vehicle driven by a small petrol engine. **4** : 186, *187*

motor-car, the horseless, engine-driven carriage that has become the chief road vehicle of this century. **4** : *124*, 125–127, 184–185, *187*

motor-car engine, the internal-combustion engine, driven by a series of explosions of petrol vapour. On the same principle but of smaller power is the motor-cycle engine. **4** : 125–126

mould, a light, furry growth of FUNGUS that appears on jam, cloth, and other non-living matter, when exposed to damp. See also MILDEW. **1** : 262–264

moult, to cast off skin, feathers or other covering. Many birds, insects and animals undergo a regular moult. See also METAMORPHOSIS. **1** : 200

mouse, a small RODENT. Mice are grey with scaly tails. The attractive little harvest mice that make bell-shaped nests in corn cause some damage to crops. Wood mice are good jumpers and climbers, and have large eyes, ears and whiskers. **1** : 11, 37, 211, 289

Mozart, Wolfgang Amadeus, one of the world's great composers. He was born in Austria in 1756, and by the age of six

was giving recitals on the harpsichord and violin. He was greatly influenced by HAYDN in his early years, and died in 1791, only 35 years old, leaving behind him a wonderful collection of operas, symphonies and other works which will never die.
5 : 233, 238–240, 243, 245–246, *248*, 253–254, 256–257

mucous membrane, the lining of the throat, nose and other passages that open to the surface of the body. **1** : 367

mudskipper, a queer fish found in estuaries of large rivers and in mangrove swamps round the coasts of Africa, Asia and Australia. Its bulging eyes lie close together on top of its head and give it a frog-like appearance. The eyes can be turned in all directions. Its front fins form a kind of arm and it is able to come out on to land and skip over the mudflats in search of food. It is very fond of insects and small crabs.
1 : 173

multiplication, a kind of addition in which the numbers added are all the same. Instead of $4 + 4 + 4 = 12$, we can say $4 \times 3 = 12$. **6** : 117–121

It is important to know your tables, at least up to 12 times, and the following sets of numbers may help. If you want to know what 5×11 make, you run your eye along the numbers opposite 5 in the left-hand margin, until you find the number under 11 in the top margin —this number is 55.

mummies, see EGYPTIANS.

mumming play, a simple

play about St. George, acted in English villages. **3** : 110

Murillo, Bartolomé Esteban, a Spanish painter who lived from 1617 to 1682. He was humbly born in Seville, and his later exquisite paintings of ragamuffins and urchins reflect his early life in the slums. Later he found he could make a lot of money very easily by turning out madonnas in large numbers, and his art fell away from its early high standard. *Boys Eating Melons and Grapes* belongs to his great period. **5** : 121

muscle, an organ of the body which contracts and so produces movement in an animal. In human beings and in all animals with backbones most muscles are attached to the bones by TENDONS, and are arranged in pairs which pull in opposite directions.
1 : 366–368, 370–375

Muses, see MYTHS AND LEGENDS.

museum, a collection and exhibition of objects relating to any field of knowledge or the arts, for example, pictures, money, old weapons, costume, china. One type of museum consists of queer things from the past, things that are no longer in use but which tell you odd things about our history. Every youngster can make his own museum from the things he finds and collects.
5 : 332 ; **6** : *300*

mushroom, a fleshy FUNGUS with an umbrella-shaped cap. Its body bears SPORES and appears in spring and autumn.
1 : 230, 265–266

music, the arrangement of sounds to produce a pleasant or "musical" effect upon the ear. It is difficult to say with certainty why one sequence of sounds is more musical than another, as in different nations and periods of history widely differing arrangements of sounds have been enjoyed as popular music. There will usually, however, be a repetition of sounds to make MELODY, and a combination of sounds to make HARMONY. Music will often make us

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2	4	6	8	10	12	14	16	18	20	22	24
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5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

want to dance as in DANCE MUSIC, or march with a swing as in music played by a military band.
5 : 221–263

musical instruments, noise or sound producers of many kinds—stringed like the violin,

woodwind like the flute, brass like the trumpet, and percussion like the drum. There are keyboard instruments, such as the piano. Some musical instruments can be made at home, like bamboo pipes.
4 : 370–371 ; **5** : *286*, 376–379

muskrat, a water-rat found chiefly in North America. It has dark glossy brown fur, and a scaly tail. **1** : 310

mussel, a MOLLUSC with a double shell, the two parts joined by a hinge.
1 : 17–18, 155–156, 275

Mussolini, Benito, the leader of the Fascist Party which seized power in Italy after the First World War. He brought Italy into the Second World War on the side of Germany, but when defeat was certain he was shot by his own countrymen. **3** : 352

mutton, see SHEEP.

mystery and miracle plays, short medieval playlets based on the stories in the Bible. They were played on wheeled platforms called pageants. See DRAMA. **3** : 100 ; **5** : *74*, 78

myths and legends, stories which nations have invented about their past and handed down by word of mouth.
5 : 9–14

Thus the Ancient Greeks invented gods and goddesses of human shape to explain the world about them and made up tales of their relations with human beings (**5** : 9–13). Among them were the Muses, nine daughters of Zeus, the chief of the gods. Each daughter was said to be interested in a different kind of Art—Terpsichore for dancing and singing, Calliope for eloquence and epic poetry, and so on. Apollo was the sun god and had a temple dedicated to him at Delphi where people asked questions, and the answers given by the priestess were said to be inspired by Apollo himself.

The Romans adopted these gods and gave them new names (**5** : 13). The Norsemen or Vikings likewise had a great mythology (**5** : 14) much of which is inherited by the modern Germans. As well as tales of gods and goddesses, mythology comprises stories about legendary or semi-mythical heroes like BEOWULF, SIEGFRIED, King ARTHUR, and the heroes of the epics of HOMER.

Then there are mythological creatures that are half beast and

half human like the centaur and faun from Greek legend, or the mermaid, fabled in many lands (**6** : *354*). There are also fabulous beasts. Dragons exist in story from China to England; the unicorn—a horse-like creature—with a single straight horn growing from its forehead, appears in medieval tales and heraldry ; and the phoenix, a beautiful bird from eastern legend, is born anew from the ashes of its own funeral pyre.

N

names, of people, are made up of Christian names, like William and Barbara, and surnames, like Smith and Mackintosh. Nicknames like Billy are used for people you know very well. **6** : 15

Nansen, Fridtjof, Norwegian Polar explorer and diplomat who lived from 1861 to 1930.
3 : 338

Napoleon Bonaparte, born in Corsica, the most famous general during the wars that followed the establishment of the French Republic (see FRENCH REVOLUTION). He defeated the Austrians and captured Malta and Alexandria with the intention of making Egypt a stage on

the way to India. But the defeat by NELSON of the French navy at the Battle of the Nile ended these hopes. Returning to France, he placed himself at the head of the government as First Consul, and, in 1804, crowned himself Emperor. He tried in 1812 to conquer Russia and failed. Other French troops were engaged in Spain in fighting the British under the Duke of WELLINGTON, who defeated them at the battles of Talavera and Vittoria and, after driving them over the Pyrenees Mountains, at Toulouse. Wellington's victories and the retreat from Moscow brought about Napoleon's downfall. He became the prisoner of the British who banished him to the Isle of Elba. Later, however, he escaped to France and renewed the war, being defeated at the Battle of Waterloo in 1815. The remainder of Napoleon's life was spent as a prisoner on the island of St. Helena. He lived from 1769 to 1821.
3 : *2*, 271–272, 277–279

narwhal, see WHALE.

National Insurance, a scheme to protect people from financial hardship in the event of sickness, unemployment or death in the family. Other benefits include Old Age pensions and widowhood benefits. The National Health Service now covers free medical treatment for all. Nearly everyone contributes week by week to these services while he is working. **3** : 195, 380–381

nave, the main body of a church separated from the AISLE

on each side by a row of columns. **5** : 198

navigation, the science of finding one's way and keeping to one's course, especially at sea or in the air.

2 : 143–145 ; **4** : *210*, 211–214

navy, the fighting ships of a country. The British Navy was founded by ALFRED THE GREAT to fight the invading Danes at sea. When the Spanish ARMADA attempted to invade England the fleet under Howard and DRAKE gained a great victory. Later, in the reigns of Charles I and Charles II, there were many sea battles against the Dutch, who gained some victories, but under the administration of Samuel PEPYS the strength of the British Navy was increased. It kept Britain safe from invasion during the war against NAPOLEON, under the leadership of NELSON, and during the two World Wars. **3** : *220–221*

Nazi, a supporter of the German political party led by Adolf HITLER. **3** : 352

Nebuchadnezzar, see ANCIENT WORLD.

neck, the part of the body connecting the head to the trunk. **1** : 371

nectar, see BEE.

nectary, the honey gland of a flower. See also BEE. **1** : 232

Nelson, Horatio, Lord, Britain's most famous admiral. He

defeated the fleets of NAPOLEON at sea as Wellington did his armies on land. He was killed in the hour of victory at the Battle of Trafalgar. He lived from 1758 to 1805. **3** : *2*, 270–272

neon tetra, a popular aquarium fish with red hind parts and a brilliant blue-green band which runs from eye to tail down either side of its body. **1** : *176*, 177

neon tubes, filled with neon gas which glows with a red-

coloured light when an electric current is passed through them. They can be shaped into letters and pictures and are much used in advertising. **4** : 309–310, *311*

Neptune, the god of the sea. In Greek mythology he was called Poseidon. **5** : 12

Nero, see ROMANS.

nerve, one of a system of fibres in the body connecting the brain and spinal cord with every part of the body. Nerves carry messages to and from the brain and control the action of the muscles. **1** : 376–380

nervous system, a mass of NERVE cells connected to, and including, the BRAIN and SPINAL CORD. The brain acts in rather the same way as a telephone exchange, receiving and sending out signals through the nerves. See also REFLEX. **1** : 376–379

nesting-box, a wooden box with a hinged lid and an entrance hole bored in the front or side, that can be set up in the garden to encourage certain birds to make their nests in it. The width of the hole depends upon the kind of bird you want to study. Tits and nuthatches, for example, can get into the box through a hole $1\frac{1}{8}$ inches in diameter, but starlings are bigger birds and need a hole of about 2 inches in diameter. The sloping lid should not fit flush with the sides of the box but should overlap like a roof so that rain runs off and the box remains dry. **1** : 86

netball, a seven-a-side team game for girls. The object of each team is to score goals by getting the ball (which is like a small round football) through a 15-inch netted ring fixed at the top of a 10-ft. post, one of which stands at either end of the netball court. **6** : 269–272

nettle, a common wild plant with needle-like hairs containing an acid poison which sting you severely when you touch them. **1** : 356

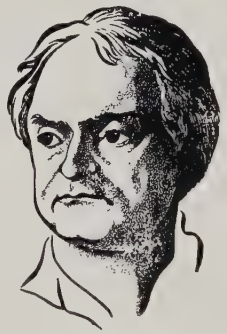
Newcomen, Thomas, the maker of one of the first STEAM-ENGINES. He lived from 1663 to 1729. **4** : 105–106

newspaper, a publication appearing daily or weekly, containing news and pictures of important events that have just happened. **3** : 340–341 ; **4** : *299*

newt, one of the group of amphibians, with a life-story like that of the FROG, except that it keeps its tail throughout its life. See also SALAMANDER. **1** : 15, *147*, 150–152

New Testament, see BIBLE.

Newton, Sir Isaac, an outstanding scientist, among whose



discoveries were the nature of white light and the laws of gravity. He also constructed a reflecting telescope. His observations and deductions established the rules governing the movements of the planets round the sun, and the effect of the moon on the tides. He lived from 1642 to 1727. **2** : 363

New York, the largest city in the U.S.A. Built partly on an island in the huge Hudson River, it has a population of about 8 million, immense skyscrapers forming a unique skyline, and a harbour through which passes half of the U.S.A.'s foreign trade. **2** : 185, *187*

New Zealand, a Dominion of the BRITISH COMMONWEALTH, south-east of Australia, noted for its wool, mutton and dairy-produce. The chief towns are WELLINGTON, the capital, and Auckland in the North Island and Christchurch and Dunedin in the South Island.

2 : 93–97, 334–338

New Zealand was first settled by the Polynesians, whose des-

cendants are known as Maoris. Its shores were charted by Captain Cook, and settlements of British colonists were established during the 19th century (**3** : 257, *314*, 315–317, 362–366).

Niagara Falls, two great waterfalls on the Niagara River on the borders of Canada and the United States between Ontario and New York State. The Niagara River flows between Lake Ontario and Lake Erie. **2** : 98 ; **4** : *81*

Nigeria, a country of the British Commonwealth in West AFRICA, north of the equator. It produces palm oil, cotton, cocoa and groundnuts. The chief river is the Niger. The chief towns are Lagos, the capital, Ibadan and Kano.

2 : *20*, *154–155*

nightingale, a woodland bird of the thrush family, well known for its wonderful singing. Its plumage is brown with lighter underparts. It eats worms, insects, and berries. **1** : *95*, 99

Nightingale, Florence, persuaded the British Army to let her start a nursing service for wounded soldiers, at the time of the CRIMEAN WAR, and thus became the founder of modern nursing. She lived from 1820 to 1910. **3** : 312, *313*

Nile, the great river whose valley is the fertile part of EGYPT, the Blue Nile and the Atbara being important tributaries. **2** : 33–36, *37*, *154*

ninepins, or skittles, a game of German origin popular in America. It consists of bowling wooden balls along an alley with the object of knocking over as many as possible of the nine heavy bottle-shaped objects set up on the ground at the far end.

6 : *255*

nitrogen, a gas which forms about 78 per cent of the air around our earth.

1 : 356, 366 ; **4** : 358

Noah's Ark, a boat which, in a story in Genesis, the first book of the Old Testament, God told Noah to build before He sent a great flood to destroy mankind because of its evil ways. Noah and his family were the only people to survive the flood, together with a male and a female of every kind of animal, which Noah had taken into his Ark. **5** : 16

Nonconformist, the name given to those who do not conform to, or agree with, all the doctrines of the CHURCH OF ENGLAND. Owing to the persecution to which they were subjected some of them sailed to America among the PILGRIM FATHERS. They supported Oliver Cromwell in the Civil War. There are many different nonconformist churches, such as BAPTISTS, CONGREGATIONALISTS, QUAKERS and Presbyterians (see KNOX). Nonconformists are now usually called "Free Churchmen." **3** : 283

Normans, Norse invaders who had settled in the part of Northern France now called Normandy. They successfully invaded England under WILLIAM THE CONQUEROR in the 11th century. They spoke an old form of French and have given us many words and place-names of French origin.

3 : 70–73, 80 ; **5** : 18

Norsemen, see DANES.

north, the direction of the North Pole. This is a useful direction to find because you can discover it by means of the stars by night and by the sun by day. A magnetic compass also points towards the North

Pole. From the compass card other directions can be reckoned.

2 : 139

North America, a large continent in the Northern Hemisphere between the Atlantic and Pacific Oceans, embraces CANADA, UNITED STATES including ALASKA, MEXICO and the Central American countries.

2 : *162–163*

Northern Rhodesia, see RHODESIA AND NYASALAND.

North Pole, see POLAR REGIONS.

North Sea, an area of water between Great Britain and the northern coast of Europe.

2 : *152–153*, 292

North-West Passage, the way from the Atlantic to the Pacific Ocean round the northern edge of the American continent. From the middle of the 16th century many efforts were made to navigate this route, but they were all blocked by ice, and it was not until 1906 that Amundsen succeeded in completing the journey.

3 : *170*, 171–175

Norway, mountainous country in north-west Europe, on the west coast of SCANDINAVIA. It has many deep coastal inlets called fiords. The capital is Oslo. **2** : 53–57, *152–153*

nose, the organ through which we breathe air into the lungs. As the air passes over the mucous membrane it is warmed and moistened and freed from dust. In addition, the nerve endings in the nose carry a message to the brain which we call the sense of smell. See also SENSES. **1** : 366–367, 380, 382

notes in music, sounds produced by different degrees of

vibration in musical instruments or in the human throat. **4** : 370

nouns, the names of things, like *desk* and *top* and *fire*; and of people and places like *Jim* and *Donald Duck* and *Jones* and *Queen Victoria* and *Edinburgh* and *Rocky Mountains*. See also GRAMMAR. **6** : 144–147

nucleus, the centre or core of anything. In animal and plant cells it is the vital organ which must always be present in the PROTOPLASM. **1** : 224

numerals, the signs for numbers, at first Roman, later Arabic. **4** : 12–13

nursehound, a small dogfish and a member of the SHARK family. It lays a single egg that is enclosed in a horny case with long trailing tendrils by which it is attached to sea weeds. **1** : 168

nursery rhymes, snatches of verse of no known authorship used by generations of mothers to amuse their children. They have of course been collected, the main old collection being called *Mother Goose's Tales*. The characters in nursery rhymes are known wherever English is spoken. **5** : 104–108 ; **6** : 19–27, *23*

nut, the hard-shelled FRUIT of certain trees and plants, such as the acorn of the oak. **1** : *234*, 238–239

nuthatch, bird with a reddish breast and a blue-grey back. It creeps along tree trunks and branches and lives on insects and nuts. **1** : *78*, 83

nylon, a plastic thread made from coal, air and water and used for making garments, like nylon stockings. **4** : 266, 284–285

O

oak, a magnificent tree, with hard, tough wood which is used in making furniture. The small, rounded nut, or fruit, is called an acorn. **1** : 199, 251–254, *255*, 258

oasis, a green or fertile spot in the desert. **1** : 315

oat, a GRASS whose seeds contain rich food stores. They provide cereals, porridge, oatmeal, rolled oats, etc. **1** : 335–336, 345–348

oblong, a flat, four-sided figure with two opposite sides longer than the other two and all angles right-angles. **6** : 112

oboe, a wood-wind instrument consisting of a very slightly tapered tube expanding to cone shape at the end and with a double-reeded mouthpiece at the other end. **5** : 227

ocarina, a small egg-shaped musical instrument with projecting mouthpiece and finger holes in the side. It gives a flute-like note. **5** : 261–262

oceans, the largest areas of water on the earth, the Pacific and the Atlantic Oceans being the biggest. Other oceans are the Indian Ocean, Southern Ocean, and Arctic Ocean. **2** : *152–165*

octopus, a shell-less MOLLUSC about two feet long, common off the Mediterranean and British coasts. It has eight arms, and can emit a "smoke-screen" of ink when escaping from its enemies. It lives in rock crevices and is considered to be good to eat. **1** : *158*, 161–164

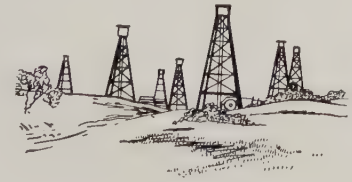
Odin, see WODEN.

Odysseus, the Greek name of ULYSSES. **5** : 12

Odyssey, see HOMER.

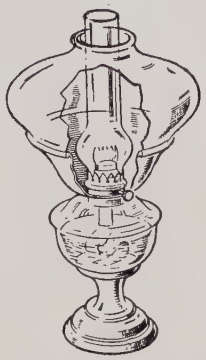
oil, a liquid fuel of vegetable origin found underground. **1** : 364 ; **4** : 100–104

It is reached by sinking an oil well (**4** : 100–101). To do



so an oil derrick (**4** : 100) is first built over the spot where the oil is thought to lie, and from the derrick is suspended a drill pipe which bores its way downward till the oil-bearing rock is reached. Crude oil called PETROLEUM then comes up the pipe. It is purified in an oil refinery (**4** : 102) and can be sent to where it is needed in a special ship called an oil tanker (**4** : 103, 196, *197*).

oil lamp, an early form of lighting used for hundreds of



years before gas or electricity was invented. **4** : 306

oil-painting, a picture painted in oil paint, using the method of the Van EYCK brothers, who mixed their colouring matter with oil instead of egg-yolk as used before. This made a rich and lasting effect when painted on canvas. Compare WATER-COLOURS, FRESCO and PASTELS. **5** : *2*, *113*, 121, *124–126*, *135–138*, *155*

oil-tanker, see TANKER.

okapi, a rare and extremely shy animal, related to the giraffe. It is found in the forest of the Congo, in West Africa. **1** : *30*

Old Testament, see BIBLE.

"Oliver Twist," see DICKENS.

opera, combines play-acting and singing. The words of an opera are written to be sung instead of spoken, and are called the libretto. The singing blends with the music of an orchestra. Opera developed in Italy where it is perhaps the most popular of the arts, and the many famous Italian opera composers include ROSSINI, VERDI and PUCCINI. Many would hold, however, that the operas of the German WAGNER are greater or at least grander, weightier and more spectacular than the operas of Italy. Usually operas were on tragic themes in which strong emotions are expressed and dramatic happenings occur. Such opera is called

grand opera. But comic operas on amusing themes were developed also and had great success in Victorian England in the work of W. S. Gilbert, writer of light verse and Arthur Sullivan, composer, *The Mikado*, *Patience*, *The Pirates of Penzance* and *The Yeoman of the Guard* being among their many light operas constantly revived (5 : 242, 249). See also MOZART, BRITTEN.

5 : 241–249, *247*

opossum, originally the name given to a group of pouched

mammals of North America. The name is now applied also to some of the pouched mammals of Australia and New Guinea belonging to the family of PHALANGERS. Sometimes it is abbreviated to possum.

1 : 66

opposition, see PARLIAMENTARY ELECTION.

orange, a large juicy reddish-yellow fruit, rich in VITAMIN C. The tree has dark green, shiny leaves, and scented white flowers. 1 : 218

Orange Free State, a province of the Union of SOUTH AFRICA. 3 : 330, 333–334

orang-utan, one of the group of APES. Its arms are so long that when the ape stands on the ground it can use its arms like crutches, to swing the body along, keeping the hind-legs more or less drawn up under the body. It is found only in Borneo and Sumatra.

1 : 74–75

orchestra, a group of musicians, with different types of musical instruments, combining to make music. There are stringed instruments—violins, violas, cellos and double basses ; wood-wind instruments—flutes, piccolo, clarinets, oboes, bassoons ; brass instruments—trumpets, trombones, tubas, French horns ; and percussion instruments—timpani or kettle-drums, bass drum, triangle, cymbals, XYLOPHONE, gong, and tubular bells. There is also the HARP, in a class apart, being a plucked string instrument. The greater part of the orchestra is made up of players of stringed instruments, of whom the first violin is accounted "leader of the orchestra." The whole orchestra is directed and controlled by the CONDUCTOR.

5 : 225–232, *229*

orchid, a tropical plant, whose flowers usually have three petals, the middle petal forming a lip. 1 : 250

organ, a musical instrument made up of sets of pipes, each pipe having a distinctive note. Wind is supplied by an electric fan and stored in windchests, whence it passes to the pipes when the player presses the notes on a keyboard. It can be a very large instrument with a great volume of sound and is normally installed in churches and big concert halls.

5 : 255

Orwell, George, English novelist and social critic, author of the satires *Animal Farm* and *Nineteen Eighty-four*. He lived from 1903 to 1950. 5 : 31

ostrich, the largest of living

birds. It is found in African and Arabian deserts and has small wings for its large body. It cannot fly but can run very fast and kill a man with its kick. 1 : *118*, 123

Ottawa, the capital of Canada, about 100 miles west of Montreal. The population is 300,000.

2 : *162*

otter, a flesh-eating MAMMAL that is a wonderful swimmer and

lives off the fish it catches. The common otter is found in Europe and Northern Asia, and the sea otter is found off the islands of the North Pacific.

1 : 48–49

oval, a word really meaning the shape of an egg, with one end rounder than the other, but also used of an ellipse, with both ends equally rounded 6 : 112

ovary, the part of a plant in which the seeds are produced. It contains the CARPELS and is found at the base of the STIGMA.

1 : 231

ovule, the egg-cells contained inside the CARPELS of a flower, from which new seeds develop after FERTILIZATION. 1 : 231, 235

Owen, Robert, Welsh factory owner and early socialist who was one of the first men to try to improve conditions of his work-people. He lived from 1771 to 1858. 3 : 233

owl, a BIRD OF PREY which hunts mice and other small creatures at night. Both eyes look straight ahead, instead of out on either side.

1 : *107*, 111–113, 305

ox, a MAMMAL that belongs to the group of wild and domestic animals generally known as CATTLE. In some countries it is used as a beast of burden.

1 : 319, *322–323*

oxygen, a gas which forms about a fifth of the air around us. Oxygen gets used up when things

burn and when we breathe. Animals and plants cannot live without it. Oxygen can be compressed in a container and used to ease the breathing in certain

illnesses or at high altitudes at which air is thin and deficient in oxygen.

1 : 366–369, 371 ; 4 : 358–359

oyster, a sea MOLLUSC which is valued as a food and cultivated as such in many parts of the world. The shell is made up of two hinged parts and when an irritating particle of substance is introduced into the shell, the oyster covers this particle with a smooth shiny substance, which eventually turns into a pearl.

1 : 18, 156

P

Pacific Ocean, the world's largest area of water, extending north and south from the Equator almost to the Polar regions, and east and west between Asia and North and South America. In some places its depth is greater than the height of Mount Everest.

2 : *162–163*, 255–258

paddle-steamer, a type of steamboat driven by revolving

paddle-wheels at the side instead of propellers at the back.

4 : 208, *209*

Paderewski, Ignace Jan, Polish pianist who lived from 1860 to 1941. In addition to being a great musician and interpreter of the works of his famous fellow-countryman Chopin, Paderewski served Poland as its Prime Minister in 1919.

5 : 236

Paganini, Niccolo, Italian violinist who lived from 1782 to 1840. His skill on the violin was so extraordinary that he was reputed to be in league with the devil. 5 : 237

painting, the art of making pictures on a flat surface such as canvas or paper or a wall.

5 : 109–166

Even cave-dwellers and savages have made pictures (5 : *114*, 112–115). The ancient Egyptians used pictures to tell stories and the ancient Greeks made pictures on their vases and walls (5 : 116). See also OIL PAINTING, WATER-COLOUR PAINTING, FRESCO.

Painting as a hobby (5 : *347–348*, 349–351) can be done with oils, water-colours, or crayons. But a specially useful and easy way to begin is with tempera powder paints which you mix with water. Begin by drawing the shape or outline of your subject, and for this use pencil or charcoal.

paints, thin clinging liquids having in them materials chosen for their power to reflect one or other COLOUR. They are used in large quantities to coat and preserve woodwork, vehicles, machinery, etc., and in small quantities for making pictures on paper or canvas. By mixing red, yellow and blue paints in various proportions many other colours can be created.

4 : *342*, 343–344

Pakistan, a republic in the British Commonwealth, comprising two regions north-west and north-east respectively of India. Most of its people are Moslems. The chief products are jute, cotton and tea. The chief cities are KARACHI and Lahore in West Pakistan, and Dacca in East Pakistan.

2 : *158–159*

Palestine, a former country of south-west Asia at the eastern end of the Mediterranean. Now divided between ISRAEL and JORDAN. 2 : 40–41 ; 6 : 2

palm, a tree, usually growing in the tropics with a round

trunk, topped by large fan-shaped or feather-shaped leaves.

1 : 315

Pampas, the name for the great areas of grassland in South America, especially the Argentine. See STEPPES, PRAIRIES, VELDT, SAVANNA. 2 : 43, 199

Panama Canal, a strip of water connecting the Atlantic and Pacific Oceans through the narrow neck of land joining North and South America. It goes over a hill by means of LOCKS. It is controlled by the United States of America.

2 : *163* ; 4 : 192

Pangolin, or scaly anteater, an insect-eating mammal found in West Africa and parts of Asia. Most of the African pangolins live on the ground but there are some that live in the trees. The Asian pangolins, for instance, are able to climb trees. They all have a protective armour of horny, overlapping scales. These toothless mammals feed on ants and termites which they dig out of the earth with the powerful claws on their forefeet. 1 : 52

panpipes, a simple and ancient musical instrument, made up of a number of pipes of different lengths, which give different notes when you blow across their tops. 4 : 370

pantomime, a dumb-show acted in ancient Rome. But today the word means a special type of stage spectacle based on some well-known fairy tale, which is turned into a feast of jokes, songs and dances, a hotch-potch of humour, tomfoolery, and coloured lights and scenery such as young children delight in. 5 : 90, *84–85*

paper, invented by the Chinese, the material on which

we can write or print and from which books and newspapers, etc. are made. Most paper is made from trees which are torn to shreds, then beaten to a milky pulp, then spread into a thin layer and squeezed dry by rollers. As it drys it toughens into the paper we know.

4 : 290–295

paper nautilus, or "argonaut," one of the sea animals without a backbone. It belongs to the group of MOLLUSCS, and the female makes a delicate silvery-white, fluted shell, in which the eggs are protected.

1 : *19*

papyrus, see EGYPTIANS.

Paraguay, an inland South American republic, consisting largely of swamps and deserts. Cattle-rearing and agriculture are the main occupations. The capital is Asunción, with a population of 103,000. **2** : *165*

paramecium, or slipper-animal, a long, narrow microscopic animal, covered with protoplasmic hairs. It is found in stagnant water and feeds upon BACTERIA. **1** : 226

parasite, a plant or animal which lives in or on some other living thing. **1** : 264

Paris, legendary Greek hero, caused the Trojan war by carrying off HELEN OF TROY. **5** : 11

Paris, on the Seine, the beautiful and historic capital of FRANCE, famous for its fine streets and buildings, its art treasures and university, the

Eiffel Tower, the restaurants and gaiety of Montmartre, and its cathedral of Notre Dame.

2 : *153*, 200, *205*

Park, Mungo, a Scottish explorer who was the first white man to reach the River Niger in Africa. He lived from 1771 to 1806. **3** : *332*

Parliament, in Britain, a law-making body of two Assemblies—the House of Commons, made up of Members of Parliament and elected by popular VOTE (see PARLIAMENTARY ELECTION), and the House of Lords, whose members in the main have a place there by reason of their birth or high position in the world of Law or in the Church of England. By these Assemblies Britain is governed; but of the two, the House of Commons holds the real power.

3 : *368*, 369–374

Parliament has had a long history. From being the instrument of the few and powerful, it has through the centuries become more and more the means of self-government for the many (**3** : 120–127).

When William the Conqueror conquered England he formed a Great Council of the barons and knights who had helped him (**3** : 122). This is like the first appearance of the House of Lords. Much later in Edward I's reign two knights were elected from each county to help to govern. This body of knights is like the first appearance of the House of Commons or at least of the principle of election on which the Commons was to be based, although the right to elect or vote for a representative was held at first by very few people.

As time went on this elementary Parliament became more powerful. Kings were always wanting money and needed the help of Parliament to raise it. In return for raising taxes kings had to agree to the laws that gradually—but with many ups and downs—made life easier and safer for more and more people. A king who despised Parliament and tried to do what he liked was CHARLES I, who thereby caused a rebellion in Scotland and later a Civil War in England that cost him his throne and his life. Later the monarchy was restored, but with its power reduced. What the kings lost, Parliament gained.

Today the real power in Britain is in the House of Commons whose members are elected by the VOTE placed in the ballot box by all who have reached the age of 21.

The Lords, too, plays a part. Its task is to act as final court of appeal in important law cases, and to discuss and revise in detail new BILLS which the Commons is trying to make part of the law. It can even block for a time the passing of a bill. But the House of Commons has the last word.

Parliament, Houses of, the great building where PARLIAMENT meets. **3** : 120

Parliamentary election, an election which occurs at least every five years in peacetime Britain. Candidates stand for Parliament and are voted for by the adult population. See VOTE.

3 : 126

Candidates normally belong to political parties of which Conservative, Labour and Liberal are the best known in Britain today. The party which manages to get a majority of its candidates elected usually forms the government (**3** : 371), and its policies tend to get translated into laws, since it can outvote its opponents in the House of Commons. Its leader becomes Prime Minister and chooses a cabinet or council of Ministers to help him. His opponents in Parliament are called the Opposition (**3** : 372).

parrot, a brightly coloured bird with a short and powerful

hooked beak. The first and fourth toes point backwards, which gives them good gripping power. Cockatoos, macaws and budgerigars all belong to this group. They are popular as pets, and some can imitate human speech to an astonishing degree.

1 : *117*, 121–124, 305, *324*

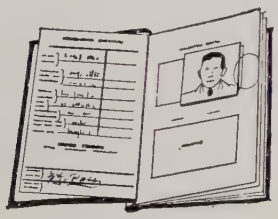
parrot fish, a fish with a mouth like a beak. It is found amongst the coral reefs of the Pacific islands, and also along the Atlantic coast of tropical America. 1 : 173, *175*

Parsons, Sir Charles, British inventor of the STEAM TURBINE. He made a steam car at the age of 14. He lived from 1854 to 1931. 4 : 114

Parthenon, see PHIDIAS.

partridge, a common GAME BIRD that often builds its nest under a bush or in a hedgerow. The eggs, olive in colour, may number from seven to twenty. 1 : 97

passport, a document issued by governments to their citizens who want to travel abroad. It



carries a photograph and description of its owner, and must be shown to the passport authorities when entering or leaving a country. 4 : 234–235

pastel, an artist's material which is a kind of crayon or chalk giving soft crumbly effects when used on rough paper. Pastel colours are never harsh. "The Girl with the Cat," by Perroneau is an example of pastel work from 18th-century France. Compare OIL PAINTING and WATER-COLOURS. 5 : 121, *123*

Pasteur, Louis, a great French scientist, made a study of germs and proved that certain of them caused certain diseases. He also *disproved* the old idea that life came into existence of its own accord in decaying matter. He discovered a cure for rabies, and

the first patient he injected with this preparation was a badly bitten shepherd boy, who completely recovered. He lived from 1822 to 1895. 1 : 330 ; 3 : 381

pasty papers, the craft of making simple designs on paper previously covered with wet paste to which colour has been added. Designs suitable for book-covers, gift-wrapping paper, etc. can be drawn with the fingertips or a dry brush or stick. 5 : 355–356, *357*

Patrick, St., a British boy of the 5th century who after many adventures achieved his ambition of bringing Christianity to the Irish people. He became Bishop of Ireland and was made the patron saint of the Irish. He lived from about 380 to 461. 3 : 35–38

pattern printing, the hobby of printing designs by very simple means. For example, a slice of potato can be carved and dipped in colour and used to stamp the design at intervals on a piece of cloth or paper. Many other objects in nature, such as seed pods can be sliced across to provide a ready-made design and used in the same way. See also LINO-CUTTING. 5 : 356–361, *360*

peacock, a bird of the pheasant family, the male of which gives a wonderful fan-shaped spread of his beautifully coloured tail feathers to attract the hen bird, or peahen. 1 : 116, *117*, 119, 296

peacock worm, a sea-worm which makes a tube of mud to live in. The delicate tentacles are pushed out beyond the rim of the tube to trap small animals and plant food, and these are then passed back to the worm's mouth. 1 : *19*

pear, the fleshy juicy fruit of a tree related to the apple. A pear is always larger at the end farthest from the stem. 1 : 350

Peary, Robert Edwin, the American explorer who was the first man to reach the North Pole. He lived from 1856 to 1920. 3 : 338–339

Peasants' Revolt, a rising in 1381 in England of the poor tenant farmers against the land-owning nobles, due to high taxes and the bad state of the war in France. 3 : 138–140

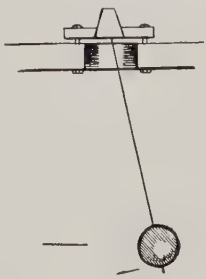
Peking, the capital of CHINA and a centre of Chinese art. Its population is over 2 millions. 2 : *158*, 253

pelican, a large web-footed WATER BIRD with an enormous bill. From the lower half of the beak hangs a pouch of loose skin, and the female feeds her young on partly-digested food from the pouch. 1 : *117*, 120

pelota, the national game of the Basques, a people who live in north-eastern Spain. 6 : *254*

Pelton wheel, a particularly effective WATER-WHEEL. 4 : 79

pendulum, a rod or cord having a weight at the end and



arranged to swing to and fro of its own momentum. This motion is so even that a pendulum is used in many clocks to regulate the works. 4 : 39–40

Penelope, the wife of ULYSSES in Greek legend, spun for ten years while awaiting her husband's return. 5 : 13

penguin, a remarkable black-and-white bird of the Southern Ocean which stands upright on land. It is a wonderful swimmer, using as paddles its wings,

which are quite useless for flying.
1 : 94, *118*, 122–123

penicillin, a germ-killing substance extracted from a green mould. It is widely used in medical treatment today.
1 : 264

peninsula, a land area that is

almost surrounded by water, such as the IBERIAN PENINSULA.
2 : 229

Penn, William, see UNITED STATES OF AMERICA.

Pennine Chain, a mountain range in northern England, extending from the Scottish border to Derbyshire.
2 : *148*, 286

penny-farthing, a nickname for an early form of the bicycle.
4 : 184

people who help us, described for younger readers. Among them are the butcher, the milkman, the policeman, the bus-driver, the teacher and the doctor. 6 : 82–85

Pepys, Samuel, a naval official who became Secretary to the Admiralty. His chatty diary written in shorthand was deciphered and published long after he was dead. *Pepys's Diary* is the most famous in English literature, bringing the later 17th century to life in a wonderful way. He lived from 1633–1703. 3 : 218

percentage, or %, means simply *per hundred*. 5% means 5 out of every 100. $33\frac{1}{3}$% means $33\frac{1}{3}$ out of every hundred and so on. If 99% of a gathering were women it would mean that only 1 out of every hundred present was not a woman.
6 : 139–140

perch, a well-known food fish. The European perch is a freshwater fish that blends well with its background ; there are also many kinds of perch living amongst the coral reefs in tropical seas, which can change colour rapidly. 1 : *293*

Percheron, a breed of large cart-horses, usually dapple-grey in colour. They originated in a district in France. 1 : 360

percussion instruments, see ORCHESTRA.

peregrine falcon, a BIRD OF PREY much used in the Middle Ages for the sport of hawking or falconry, in which the falcon is sent into the air to catch another bird. 1 : *107*, 116

perennial, a plant that lives for many years, bearing new leaves and flowers year after year, as distinct from an ANNUAL or a BIENNIAL. 1 : 247

Pericles, see GREEKS.

periscope, a device with two mirrors which enables you to see round corners or over walls. Submarine periscopes use the same principle. 4 : 207, 325

Perrault, Charles, the most famous French writer of fairy-tales, among them being *Cinderella* and *Blue Beard*. He lived from 1628 to 1703. 5 : 26

Persia, also known as Iran, a largely desert country of south-west ASIA between Iraq and Afghanistan. It has large oil-fields and is noted for carpet-making. The chief towns are Tehran, the capital, and Tabriz.
2 : *158–159*

perspective in drawing, the method of representing objects on a flat surface such as

paper or canvas so that they seem to have the same solidity and distance as the actual objects would have if they were there before your eyes. Thus, to the eye, parallel lines going away from you like railway lines, or pavement kerbs, or the lines made by the wall of a room at the ceiling and at the floor, seem to run slightly towards each other ; and indeed when projected far enough will seem to meet at a point (although we know that because they are parallel they can never actually meet). This appearance the artist must reproduce if he wants his picture to look like what the eye sees. And this is how he does it. 5 : 161

Peru, a country on the west coast of SOUTH AMERICA. The chief products are cotton, petroleum, sugar and minerals. The capital is Lima. 2 : *164–165*

petal, the parts of a plant that form the head of the flower. Insects may be attracted to a flower by the bright colour of its petals, or by its scent.
1 : 232, *233*

Peter Pan, see BARRIE, and PLAYS FOR CHILDREN.

petrol engine, see MOTOR-CAR ENGINE.

petroleum, the natural OIL from which petrol and lubricating oil are produced. It is found in oil-fields below the ground, between layers of rocks, and is often under great pressure from gas, so that when a well is sunk the petroleum shoots out in a huge fountain, which can be set alight. 4 : 100–104

phalanger, name of a group of pouched MAMMALS found in Australia and New Guinea. They all live in the trees, feeding on the leaves. Members of the family include the KOALA, FLYING PHALANGER, CUSCUS and ring-tai ed possum. See also OPOSSUM. 1 : *60*, 63–64, 66

pharaoh, a ruler of the Ancient EGYPTIANS. Many of the pharaohs had huge PYRAMIDS built as their tombs.
6 : *318*

One famous pharaoh is Tutankhamen, who lived about 1350 B.C. He is important because his tomb was discovered, filled with household articles and treasures used in a civilization of over three thousand years ago.

pheasant, a beautiful woodland bird of which there are

several varieties all over the world. The pheasant is a GAME BIRD, excellent to eat. It makes its nest in a hollow on the ground and the eggs may be from seven to eighteen in number. 1 : 93, *96*, 97, 99

Phidias, a Greek, one of the great figures of the world's art, the architect of the Parthenon, and the most famous sculptor during the finest period of Athenian sculpture. He lived from 490 to 432 B.C. 5 : 174

philately, see STAMP-COLLECTING.

Philip II, of Macedon, see GREEKS.

Phoenicians, see ROMANS.

photograph, an impression of the outside world made by allowing light momentarily to strike a chemically-prepared film held at the rear of the little black box which is a CAMERA. This film now gives a "negative" impression of what the camera saw—negative because all the dark parts are white and the white parts dark. A further process gives us a "positive" picture with the right tone values. 4 : 346–347

Photography is the craft or hobby of taking photographs

with a camera (5 : *286*, 343–344) and developing, fixing and printing the pictures which result.

photosynthesis, means "putting together with the aid of light." It is the process by which green plants make their own food. This can take place only in the presence of chlorophyll, the green substance in the leaves, and in sunlight. Chlorophyll absorbs the sun's rays and releases energy, so that plants are able to combine the water taken up through their roots with carbon dioxide taken from the air through breathing-pores in the leaves, to make the sugar on which they live. Plants that have no chlorophyll cannot make their own food. See FUNGUS. 1 : 12, 229

phototelegraphy, the sending of pictures over a telegraph wire. It is one application of the use of the TELEGRAPH. 4 : 174-176

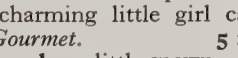
piano, or pianoforte, a keyboard musical instrument having strings like a harp strung on a frame inside the case. When you press the white or black keys of the keyboard outside, small hammers inside swing forward and strike the strings so that they vibrate and make their own sounds, each string, of course, having a note on the keyboard to correspond.

The modern pianoforte has a range of notes covering at least 7 octaves. It also has a great range of volume—indeed the name *pianoforte* means soft-loud.

There were several ancestors of the piano, the earliest being the Elizabethan virginal, followed by the clavichord, the harpsichord and the spinet. 5 : 232-237

Picasso, Pablo, a Spanish painter and sculptor who was born in 1881. Picasso can perhaps best be described as an experimenter in art forms. He is never satisfied with one style of painting, and is continually seeking to delight or startle the public with new shapes, colours and materials. One of his early and more orthodox paintings is the charming little girl called *Le Gourmet.* 5 : 154

piccolo, a little FLUTE with a



very penetrating note. 5 : 227

picture-writing, messages or information made by means of pictures. Out of this practice writing itself developed. 4 : 11

"Pied Piper of Hamelin," see BROWNING.

pig, a domesticated animal bred for the food it provides. From it we get bacon, pork, ham and lard. The pig is still found wild in certain parts of the world. 1 : 331–332

pigeon, bird belonging to the same family as the dove. It has a stout body, short legs, soft feathers, and makes a cooing sound. 1 : 324–325

pilchard, a sea fish of northern waters, related to the HERRING. 1 : 184

pile-driver, see STEAM HAMMER.

Pilgrim Fathers, the English settlers in New England who

sailed to America in the *Mayflower* in 1620. They were mostly Puritans, seeking freedom to worship God in their own way. They numbered seventy-four men and twenty-eight women. 3 : 205–208

"Pilgrim's Progress," see BUNYAN.

pipefish, a fish closely related to the sea-horse. It is eel-like in form, with a long, tube-like snout. The male looks after the eggs, which are usually fixed to the underside of the body by a sticky secretion from the skin, but the greater pipefish carries them in a pouch. 1 : 173

pirates, the robbers of the high seas who flourished during the 16th to 18th centuries by attacking and plundering ships carrying rich cargoes. In time most of them were resisted and captured, brought to trial and hanged. The Mediterranean and the Spanish Main were the chief hunting-grounds for the pirates. 6 : *371*

pistil, the female part of a flower, containing the egg-cells which form new seeds when

fertilized by pollen-grains from a STAMEN. The pistil is made up of the OVARY, STIGMA and STYLE. 1 : 231, *233*

pitcher-plant, an INSECT-EATING PLANT from the tropics. It has pitcher-shaped leaves into which insects crawl in search of honey. Once inside, they find the walls of the pitcher too slippery to climb up and eventually they drown in a "well" of digestive fluid at the bottom of the pitcher. 1 : 271

pit-pony, a special breed of HORSE used for pulling trucks in coal mines. 1 : 318–319

Pitt, William, Prime Minister of Britain during the wars against Napoleon. He lived from 1759 to 1806. 3 : 125

place-names, often show their Anglo-Saxon origin in their modern ending, e.g. *-ham* or *-ton,* the Anglo-Saxon for village. 3 : 51

They may show a Roman origin (3 : 24, 32) or French influence (3 : 80). See NORMANS.

plane, a tool for smoothing

planks when making them into tables, etc. 4 : 252

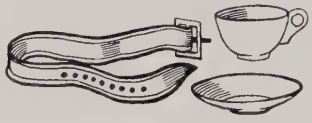
planet, a heavenly body that is a satellite of a star, which is a flaming ball of fire. The sun is a star that has nine planets, one of which is the earth on which we live. See also SOLAR SYSTEM. 2 : 355–358, *368*

plant, any form of life on earth other than animal—vegetable as distinct from animal. Most plants live and grow by getting materials for food partly from the earth through their roots and partly from the air through the pores of their leaves. They make their own food by PHOTOSYNTHESIS. The leaves of a plant are carried on a stem or stalk, and the higher forms generally bear flowers and fruit. From the FLOWER come the SEEDS which form new plants. There are certain plants that cannot make their own food but live on other plants, or on decaying matter, such as FUNGUS. See also LEAF, ROOT. 1 : 11–13, 227–271, *233–234, 243–246, 255–256*

plantation, a large cultivated estate on which the same crop is grown year after year, as in tea, coffee, sugar, cotton and rubber plantations. 1 : 327

plasma, the colourless fluid of the BLOOD. 1 : 369–370

plastics, materials that are easily moulded or pressed into the shapes of useful articles such



as cups and saucers, belts, or toys. Some, like NYLON, can be made into fine thread and then woven. 4 : 263–266

Plato, see GREEKS.

platypus, a remarkable MAMMAL found in eastern Australia and in Tasmania. It has thick fur, webbed feet, and a bill shaped like that of a duck. Like the ECHIDNA, it lays eggs instead of giving birth to living young. 1 : 70–71

play, a story written in the form of conversation, to be learned by heart and acted on the stage before an audience. See also DRAMA. 5 : 75–80

plays for children, not very plentiful. Among the famous ones are *Peter Pan* by J. M. Barrie, *The Blue Bird* by Maurice Maeterlinck, and *Toad of Toad Hall,* the play based on *The Wind in the Willows* by Kenneth Grahame. See PANTOMIME. 5 : 80–90

plough, a farming instrument used for cutting, lifting and turning over the soil in the preparation of a seed bed. It consists of a blade or blades fitted into a framework which is pulled or pushed by hand, by animals or by machinery. 1 : 334, 346, 354

plover, a bird of marshland, field and moor, that nests on the ground. The green plover, or lapwing, is specially attractive with its feathery crest, white splash on the neck and greenish-black plumage with chestnut patches that glint in the sun. It is well known in the spring for its sad call: "Pee-wit." 1 : 90–92

Plutarch, see GREEKS.

Plymouth Rock, the boulder near which the PILGRIM FATHERS landed on the shores of America. 3 : 206

It is also the name of a breed of domestic fowl (1 : 360).

polar front, a weather occurrence in which the warm air from the Atlantic meets the cold air from the polar regions. It happens, for example, off the coast of Ireland with results that affect the weather elsewhere. 2 : 110, 120

polar regions, the icy areas near to the North and South Poles which derive less warmth from the sun's rays than any other parts of the world. 2 : 59

The earth spins round and the line from top to bottom round which it spins is called its axis. One end of this axis is the North Pole and the other end is the South Pole. See also AMUNDSEN and PEARY.

Pole Star, the star which is directly overhead at the North Pole and by means of which ships and aircraft can navigate at night. 2 : 139, 375

police, the modern force, the purpose of which is to catch those who break the LAW and bring them to TRIAL. They are descended from the 19th-century force devised by Sir Robert Peel. Part of the police force is the detective branch, of which the best known in Britain is the Criminal Investigation Department at Scotland Yard.

Children should never be afraid of approaching a policeman for help or advice. 3 : 289

political party, a group of people having broad agreement as to how the questions of the day should be solved. Each political party exists to educate people in its own ideas and ideals, and strives to get people of its own way of thinking into Parliament. See also PARLIAMENTARY ELECTION. **3**: 371–372

Pollaiuolo, Antonio, an Italian painter and sculptor who lived from 1429 to 1498. He devoted much of his time to studying geometry, PERSPECTIVE and anatomy in order to perfect his art. The result can be seen in the action portrayed in *The Martyrdom of St. Sebastian.* **5**: 132

pollen, the male cells of a plant, which must unite with the female cells of a plant to form a new SEED. See ANTHER; FERTILIZATION; POLLINATION; STAMEN. **1**: 231–232, 235

pollination, the carrying of POLLEN to reach the seed-bearing part of a plant, and so fertilize the seed. This is how it is done—the pollen grains, which are contained within the ANTHERS of a flower are transferred by wind, water, birds,

insects or other means to a STIGMA. This is the top of the female part of a flower called the PISTIL. The hollow stalk which carries the stigma is known as the STYLE. In some cases all this happens within one flower. In other cases the pollen of one flower has to reach the stigma of another flower of the same kind. Each pollen grain which sticks to the stigma grows into a little tube down which pass two male cells. These cells then pass down the style of the pistil, and into the egg compartments at the bottom. These are called CARPELS. The eggs in the carpels are called OVULES. When these are fertilized they grow into SEEDS. **1**: 231–232, *233*, 235

polo, originally an Indian game, played on ponies between two teams of four players, each

having a long slender mallet with which to strike the ball. In some respects it is rather like hockey. **6**: *255*

polyp, a small sea animal with a tube-like body bearing a crown of tentacles at one end. This is closed at the other end and attached to the sea bottom. An example of a polyp is CORAL. **1**: 274–275

polypody, a FERN whose leaves are divided into many leaflets, looking like lots of feet. The name means "many footed." **1**: 260

Pompeii, an ancient Roman city, near Naples, buried by

the eruption of Mount Vesuvius in 79 A.D. **2**: 90

Pontius Pilate, the Roman Governor of Judaea who gave in to the priests and their supporters who wished to have JESUS killed. **6**: 199–200

poor people, a problem of every age and generation. In the Middle Ages help was given by the monasteries. When they were closed, a Poor Law was passed making the people of each parish raise money to help the unemployed and the starving. This was uneven in its effects and in the 18th century a grim workhouse system prevailed. In the 20th century a small Old Age Pension of 5s. a week was given to people over seventy, and in the middle of the century a NATIONAL INSURANCE system to which all contribute provides a medical service, unemployment benefit and old age pensions for all. **3**: 193–195

poplar, a tree with a slender trunk of soft white wood, covered with a rough bark. The leaves are shiny and the flowers are produced as CATKINS. **1**: 235

poppy, a hairy-stemmed plant with large attractive flowers, usually scarlet, but sometimes white or yellow. The stems contain a milky juice, and OPIUM is made from the unripe pods of the opium poppy. **1**: 236

porcupine, a RODENT, or gnawing animal, which has lots of stiff sharp quills to protect it against enemies. The crested porcupine is the best-known, and is found in Africa, Asia and southern Europe. The porcupines found in America belong to a separate family. **1**: *41*

porpoise, see WHALE.

portcullis, see MOAT.

Portugal, a country of south-west Europe on the west coast of the IBERIAN PENINSULA. It is a mainly agricultural country, famous for its vineyards and wines. The capital is LISBON, the chief river, the Tagus. **2**: *152–153*

postal service, the organization in each country by which letters or mail can be sent and delivered to almost any part of the world. **4**: 165–171; **3**: 298–299

The term "post" comes to us from the days when letters were carried on horseback from one stage or "post" to the next (4 : 164), while messages of urgent national importance were sent by beacon (4 : 163). See also TELEGRAPH. Sir Rowland Hill (4 : 165) introduced the penny post in 1840, by which all letters were sent at the same rate regardless of distance. He lived from 1795 to 1879.

postcards, see COLLECTORS' HOBBIES.

potato, a swollen underground TUBER of the potato plant. It is a valuable form of food. New plants are grown from old potatoes. 1 : 210, 329, 350–351, 354–357, 362

potato-cuts, see PATTERN PRINTING.

Potter, Beatrix, an English writer whose little stories about animals have become the treasured inheritance of 20th-century children. She lived from 1866 to 1943. 5 : 32

potter's wheel, a simple machine for shaping china objects by hand. 4 : 267

pottery, the making of plates, cups, vases and other household ware from clay.

4 : 267–273, *271*

In England the best china-clay is found in Cornwall. All china and earthenware articles are heated in a kiln to harden them

after they have been shaped (4 : 269). They are then dipped in glaze to make them watertight. The patterns are either under or over the glaze (4 : 272–273). Porcelain is made of a specially fine clay, and fired at a high temperature.

A district famous for its manufacture of china and earthenware is called the Potteries (2 : 279), and covers a large area of North Staffordshire around Stoke-on-Trent.

pouched mammals, or marsupials, MAMMALS that carry their young in a pouch of skin on the underside of the body, until they are strong enough to look after themselves. At one time there were pouched mammals in many parts of the world, but they have died out everywhere except in Australia and in America (see OPOSSUMS). The KANGAROO is the best known of these today.

1 : *60*, 61–67, 286

The ECHIDNA has a pouch but belongs to a different group of mammals. The diprotodon (1 : 286) was one of the pouched mammals that lived millions of years ago.

Pounds, John, a crippled shoe-mender who started to teach poor children when there were no schools for them. Thus was started the first "ragged school", which Lord SHAFTESBURY helped to develop into a general movement of simple schools for children of the poor.

3 : 280–281

power-station, a building in which ELECTRICITY is generated from a generator worked either by a steam turbine, water turbine or diesel engine.

4 : *82–83*, *152* ; 6 : 372

prairies, the name for the grasslands of Canada and the U.S.A. See also PAMPAS, STEPPES, SAVANNA, and VELDT.

2 : 42

prawn, see CRUSTACEAN.

Prayer Book, introduced by Thomas CRANMER in 1549, setting out the services of the Church of England.

3 : 164–166

praying mantis, an insect belonging to the group that includes grasshoppers, crickets, earwigs and leaf-insects. Its forelegs are much longer than the other two pairs, and have strong, sharp spines ; it uses them to grasp its prey in a vice-like grip. Its victims include spiders, beetles and even the dangerous hornet. Its colour blends well with its surroundings and helps it to remain concealed. 1 : 207

precious stones, of which rubies are the rarest but diamonds the most popular. The cutting and polishing of diamonds and other gems is an industry in which Holland excels. The greatest diamond mines are in South Africa.

2 : 346, *350*

prehistoric painting, see CAVE ART.

prepositions, little words that show connexions or relationships between things : The cat sat *on* the mat. *On* shows a relationship between cat and mat. The cat walked *across* the mat. *Across* shows a different kind of relationship between cat and mat. See also GRAMMAR.

6 : 154

Presbyterians, see KNOX.

pressed plants, a collecting hobby for all who like studying wild flowers. 5 : 305–306, *307*

press gang, a naval party in olden times whose job was to recruit men for the Royal Navy, if necessary by force.

3 : 217

pressure point, one of a number of points on the human body where the artery is near enough to the surface of the skin for the flow of blood to be temporarily stopped by pressure.

1 : 371

Pretoria, the capital of the Transvaal, also the administrative capital of the Union of SOUTH AFRICA. 2 : *154*

Prince of Wales, the title given to the eldest son of the British monarch. It was first given by Edward I to his baby son at Caernarvon in 1284.

3 : *116*, 117–118

Princes in the Tower, see EDWARD V.

printing, the reproduction of words and pictures, etc., by a mechanical process.

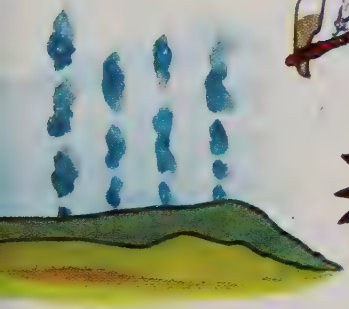
4 : 295–304, *299–302* ; 3 : 155–156

Printing was first used by the Chinese. Johann Gutenberg, who lived in Germany from about 1394 to 1468, used movable type, and William CAXTON (3 : 153–156) brought this art to England. From this beginning developed the various printing processes used today. Books and newspapers are printed, the

wigwam or tepee

tomahawk

hunting the bison, also known as the buffalo



smoke signals

war dance

making fire

travois for carrying heavy loads

moccasins

smoking the pipe of peace

water

midday

night

Red Indian signs

village

war

peace

WHEN RED INDIANS ROAMED THE PLAINS OF NORTH AMERICA

a Roman senator speaks to the Senate

the water supply flows along the top of this aqued

one gladiator armed with trident and net
fights another armed with sword and shield

a Roman general returns in triumph from the wars and passes through a triumphal arch

THE ROMANS WERE A WARLIKE PEOPLE WHO RULED A GREAT EMPIRE

latter by means of rotary printing presses (**4** : 298–303, *299*). Normally printing is done with black ink on white paper, but pictures can also be printed in colour. See COLOUR-PRINTING.

prism, a solid figure. A glass prism with a triangular end is able to split up WHITE light into the colours of the RAINBOW.
4 : 338, *339*

projector, an invention on the principle of the MAGIC LANTERN for shining the individual photographs of a piece of film on to a screen so that the people in the film seem to move.
4 : 349–350

pronouns, words that we can use instead of nouns. Instead of: "Tommy cried" we can say: "*He* cried." See also GRAMMAR.
6 : 153–154

Protestant, originally one who "protested" against what he believed to be the false doctrine and practice of the ROMAN CATHOLIC Church. This led to a Protestant REFORMATION, in which many churches were formed independent of the Pope, who is the head of the Roman Catholic church. See also CHURCH OF ENGLAND and NONCONFORMIST. **3** : 160–162

prothallus, a small, flattish, simple plant body from which grows a FERN. **1** : 260

protoplasm, a jelly-like substance of living matter. See AMOEBA. **1** : 224, 273

Psalms, Book of, in the Old Testament, the hymn book of the Jews, and used in both Jewish and Christian worship. Some of the psalms are said to have been written by David, the shepherd boy who killed the giant Goliath with a stone and later became King of Israel. Separate collections of these psalms are sometimes called psalters and in the Middle Ages they were often beautifully illustrated. **5** : *38*, 119

pterodactyl, a prehistoric flying reptile with large leathery wings. It had narrow, bony beak-like jaws armed with sharp teeth. **1** : 280, *281*, 285

Puccini, Giacomo, one of the most lively and melodious of the many Italian composers of opera. Among his works are the world-famous *Madame Butterfly* and *La Bohème*. He lived from 1858 to 1924. **5** : 242, 246

puff adder, one of the highly-poisonous SNAKES found in Africa, although its bite is not so often fatal as is generally believed. This snake literally swells with rage, for when it is angry, or alarmed, it draws a deep breath, so inflating itself, and puffs it out gradually.
1 : 131

puffin, a sea bird with a parrot-shaped beak, plump body and stumpy tail. It has webbed feet and lives on cliffs or lonely islands.
1 : *108*, 111

pulley, a tool used for lifting heavy objects to a height. Using a pulley takes more time but less effort. **4** : 24

pulse, the rhythmic wave of pressure caused by the pumping action of the heart, as it forces blood through the ARTERIES. It can be felt most strongly in the artery on the underside of the wrist, by placing the tips of the first and second fingers over the artery. **1** : 371

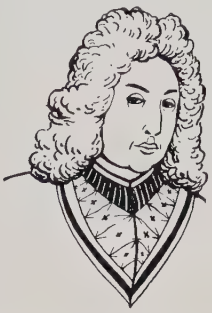
pump, a tool for drawing water or air from one place and sending it to another.
4 : 70–71

A cottage pump takes water out of the well and pours it into the pail. A bicycle pump sucks in the air around it and pushes it into your tyre. See also SYRINGE.

punctuation, the system of signs (including the comma, full stop, colon, semi-colon, question mark, quotation marks, dash and brackets) which help to make our meaning clearer to the reader. Writing done without punctuation marks is very difficult to follow, and it shows politeness as well as common-sense to learn to punctuate properly. **6** : 155-157

pupa, see COCOON.

Purcell, Henry, great English composer and organist of Westminster Abbey, whose work includes an early OPERA, *Dido and Aeneas*, as well as much



church and CHAMBER-MUSIC. He lived from 1659 to 1695.
5 : 250

Puritans, or Low Churchmen, later often NONCONFORMISTS, were those who aimed at a more severe reform of religion than the official reforms of the High Churchmen. In the Civil War in England the Puritans tended to be supporters of Parliament, High Churchmen supporters of the King. **3** : 197, 205

purple vetch, a common weed, found in hedges and bushy places. It carries its pale purple flowers in bunches of four to six. **1** : 240

pygmies, people of Negro stock who seldom grow more than 4 feet tall. The pygmies of the hot, wet forests of Central Africa are the best known, but others are found in parts of Indonesia, Malaya, New Guinea and the Philippine Islands.
1 : 309–310, *311* ; **2** : 18, *19*

pyramids, ancient, square-based structures of great size built in Egypt as tombs for Egyptian kings of the pre-Christian era. See also PHARAOH.
2 : 32, **6** : *318*

Pyrenees, a mountain range between France and Spain.
2 : *152*

python, a snake 20 feet long, common in Australia, Africa and Asia. Like the boa-constrictor of South America, it kills its prey by coiling itself around the victim and crushing it to death. A snake of this size can swallow a pig. **1** : 128–129, *135*

Q

Quakers, nickname for members of the Society of Friends, the founder of which was George Fox, an English preacher who spoke of "quaking at the word of the Lord." He lived from 1642 to 1691. They believe that Christ makes himself known to man by inward guidance without necessarily involving church services and ritual. As an example, see Elizabeth FRY.

3 : 282–283

quaking grass, or totter grass, a GRASS with a loose pyramid of purple flowers, and flat leaves. **1** : 240

quarry, a place where certain ROCKS useful to men can be cut out of the earth, sometimes with the help of explosives.

2 : 105

quartet, see CHAMBER-MUSIC.

Quebec, capital of the province of Quebec, Canada, and scene of WOLFE'S victory over the French in 1759.

3 : *244*, 245–246

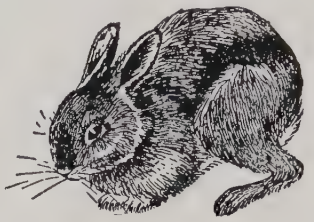
Queen, in Britain, the present formal head of the British Commonwealth of Nations as well as of the UNITED KINGDOM of Great Britain and Northern Ireland, and the Colonies, holding the position by reason of birth, not election. The Queen is the symbol of the unity of these nations and peoples, reigning over them but letting each country, including Britain, rule itself through its own elected Parliaments.

3 : *368*, 373–374

Question Time, a special time set aside each day for the answering in the House of Commons of questions raised at an earlier date by any Member of Parliament. **3** : 372

R

rabbit, a MAMMAL that belongs to the group of animals that gnaw their food, but is not a RODENT, as previously believed. Rabbits and HARES are now described as lagomorphs, meaning "shaped like a hare." Rabbits live together in groups, in earth burrows or warrens. They have many enemies, including foxes, weasels and large birds of



prey. They breed fast, and are great enemies of the farmer, for they eat his grass and young wheat.

Young rabbits are born blind and naked. **1** : 40

race, a group of mankind according to such features as the colour of skin, the straightness or curliness of hair, and the shapes of cheekbones and noses. It is an understandable grouping but not very reliable because of the mass migrations and the inter-marrying that has taken place through the centuries. The white-skinned people, Europeans, for example, have the same ancestors as have the brown-skinned people of India.

2 : *172*, 173–178

Rachmaninov, Sergei, a Russian composer who went to live in America and whose piano CONCERTOS capture a mood of intense romantic feeling. He was a distinguished pianist and conductor as well as being a considerable composer. He lived from 1873 to 1943.

5 : 233, 236

radar, an instrument which sends out radio waves to detect the approach or presence of another solid but unseen object, such as an aeroplane, submarine, iceberg, or coast. Such objects reflect back or "echo" the radio waves, and the instrument picks up the echo and shows on a screen whatever caused it.

4 : 204–205, 329, 354

radiation, the most direct method by which HEAT spreads, the other two methods being by CONDUCTION and CONVECTION.

4 : 32

Other forms of radiation, however, are LIGHT rays and X-rays (see RÖNTGEN).

radio, the most modern form of communication by means of electric waves, also, the set itself which receives the waves and turns them back into the sounds that were broadcast. See also MICROPHONE, AERIAL.

4 : 179–183

radio telescope, a big metal bowl able to pick up radio waves from distant stars; it can also send out waves and pick up their echoes as they bounce back from the moon or from rockets and space satellites as they travel through the universe.

2 : 382–3

Raeburn, Sir Henry, a Scottish portrait painter who lived from 1756 to 1823. His *Boy With a Rabbit* and his portrait, *The Macnab*, illustrate the type of picture at which he excelled.

5 : 122

"ragged school," see John POUNDS.

Rahere, the jester of Henry I who became a friar and built the original St. Bartholomew's Hospital. **3** : 81–85

railways, one of the lifelines of trade transporting day by day, not only people, but food, coal, mail, etc., to where they are needed. **2** : 270

The longest railway is the Trans-Siberian from west Russia to east Russia.

See also TRAIN.

rain, occurs when clouds which are really masses of water-vapour and tiny droplets of moisture get into colder air. Then the vapour becomes large drops of water and falls as rain.

2 : 106

rainbow, a phenomenon caused by the drops of moisture in the atmosphere acting like PRISMS in splitting up and reflecting white light into the COLOURS of which it is composed.

4 : 337, *340*, 344

Raleigh, Sir Walter, a great man who lived during the reign of Elizabeth I. He was sailor-adventurer, author and explorer all in one. He founded a colony in Virginia, in America,

and he may have introduced into England the potato and tobacco-smoking. He was executed by James I, who suspected him of treason. He lived from about 1552 to 1618.

3 : 189–190, *191*, 193

Ransome, Arthur, author of a famous series of novels for boys and girls; he is also a keen angler and sailor. He was born in 1884. 5 : 70

Raphael, early 16th-century Italian artist, trained in

Florence, who became one of the world's greatest religious painters. His frescoes decorate the Vatican. He employed painters to work for him, himself supervising and improving on their work. He lived from 1483 to 1520. 5 : *2*, 122, 132

rat, a destructive pest belonging to the RODENT group. Because of the enormous damage it does to crops and food stores and its power of carrying disease, constant war is waged against the rat. The water-rat, or VOLE, however, is harmless.

1 : 38, 290

rattlesnake, a poisonous American SNAKE with a series of horny rings, or "buttons," at the end of the tail. The snake raises and shakes this when angry, and it makes a warning rattling sound.

1 : 131–132, *135*

ray, a flat fish with gristly skeleton related to the shark.

1 : 168–169

The electric ray (1 : 172–173, *175*) can kill its prey or enemies with an electric shock.

rayon, a thread made from pulped wood and used for weaving into rayon cloth for clothing, etc. 4 : 284

Reade, Charles, an English novelist whose most famous work is the wonderful romance of the Middle Ages, *The Cloister and the Hearth*. He lived from 1814 to 1884. 5 : 59

rebus, a picture-writing puzzle. 4 : 11

receptacle, anything used to receive or contain something. In flowering plants the receptacle is the base of the FLOWER head where it joins the stem.

1 : 232

recitative, the utterance of a passage in a sing-song voice with the accompaniment of a few chords to keep the singer on the key. It occurs in the prosier passages of OPERA leading up to the more formal arias. 5 : 243

recorder, an early type of flute, common in the Elizabethan age and revived to become a favourite instrument for youthful players in our own day. 5 : 262, 264

Red Cross, a world-wide organization for the medical treatment, care and welfare of the sick and wounded, prisoners-of-war and refugees. The idea of such an organization came from Jean Henri Dunant, a Swiss banker, in 1864, and the Red Cross headquarters are in Geneva, Switzerland. There is also a Junior Red Cross, which young people can join. In Moslem countries a red crescent is used as the emblem. 3 : 347

Red Indians, the early inhabitants of the American continent, who now live peacefully alongside the white men with whom a hundred years ago they were often at war. In those days they were mainly tent-dwellers who lived by hunting the bison which roamed the plains in great numbers or by catching the salmon in the rivers. The white settlers, who could live by growing crops and rearing cattle, soon multiplied and spread, so that the Indians were outnumbered and defeated by the superior strength and arms of the newcomers. 6 : *389*

reflections, images in a mirror or other shiny flat surface caused by LIGHT rays being thrown back. 4 : 323–324

Distorting MIRRORS (4 : 324) have a curved surface which produces the funny faces.

reflex action, a movement of the body not controlled by the will, but caused by a mechanical reaction to an outside cause. 1 : 378

Reformation, the series of changes, mainly religious, that took place from the 15th to the 17th centuries and resulted in the reform of the Church in England, and in several other countries. In this struggle Roman Catholics and Protestants were cruel to each other, each side having its martyrs. Among the Protestants Archbishop CRANMER and Bishops Latimer and Ridley were burnt at the stake. Among the Catholics Sir Thomas MORE and Bishop John Fisher were executed.

3 : 162–166; 5 : 133

refraction, the bending of rays of light. See also LENS.

4 : 326–327

refrigerator, a kind of cupboard or box in which is a device for keeping things cold. Used as a food store, it prevents food from going bad.

4 : 53–54, *55*

refrigerator ship, a vessel for carrying food across the sea in a frozen condition so that it will not go bad.

4 : 201–202; 2 : 198

reindeer, a DEER rendered tame and kept in herds like cattle in Lapland, Sweden and Siberia. They can live off certain LICHENS which would not keep cattle alive. See also CARIBOU. 1 : 44, 303, 320, *323*; 2 : 53–59

reindeer moss, a grey, branching LICHEN which grows in

parts of the colder regions in northern lands. It forms the main food of the Lapland reindeer in winter. 1 : 303

Rembrandt, Harmens van Rijn, a world-renowned Dutch painter of portraits and Biblical

subjects. Rembrandt loved to paint the kind of scene in which light breaks dramatically into the darkness of a shadowy room. His tones are sombre, his colours sparingly used, but his pictures always look rich and his human figures have great character and the warmth of life. He lived from 1606 to 1669.

5 : 111–112, 145–148

remora, a deep sea fish with a sucker on top of its head. It can attach itself by this sucker to the underside of a shark, to benefit from scraps of food left over from the shark's feasts.

1 : 170

Renaissance, a word meaning rebirth. It refers to the rebirth of learning which began in Italy and spread throughout Europe in the 15th and 16th centuries. It is said to have been helped by the capture of Constantinople by the Turks in 1453 and the flight of the scholars there to Italy. These scholars had studied the wisdom of the ANCIENT WORLD, and through the new invention of printing the books of ancient Greece and Rome were multiplied and widely read. This new spirit of learning and inquiry brought with it a great revival in literature, the theatre and art, and statues, paintings, plays and poems were widely appreciated. It was, therefore, an age of great painters, sculptors and architects, poets, playwrights and men of learning.

5 : *86*, 88, 121–133

reptiles, cold-blooded animals with backbones and scaly skin. They include CROCODILES, LIZARDS, SNAKES and TORTOISES, and, of course, the extinct prehistoric monsters of millions of years ago—the Age of Reptiles. Reptiles do not undergo METAMORPHOSIS, but look like small editions of their parents when they are born. Some are born alive, and some hatch from eggs.

1 : 15, *29* 125–142, *135–136*, 278–285

reservoir, a man-made lake for holding water that is going to be purified and piped to our homes. See WATERWORKS.

4 : 72

resin, a sticky substance that oozes from cuts in the bark of firs and spruces, then solidifies. From resin we get turpentine for mixing in paints. 2 : 342

respiration, the way in which air is taken into the body, oxygen is absorbed from it, and carbon dioxide gas is given out. The act of breathing is part of this process. When we breathe in we expand our LUNGS and draw air down the windpipe to each lung. Here there is an interchange between the OXYGEN in the air and CARBON DIOXIDE in the blood. When we compress the lungs the stale air is forced out, and with it goes the carbon dioxide.

1 : 367–368

Plants breathe through pores on the underside of the leaves (1 : 229).

Reynolds, Sir Joshua, English fashionable painter of the 18th century and the first President of the Royal Academy. He wrote and lectured on art. He lived from 1723 to 1792.

3 : 239

Rhine, the chief river of GERMANY, 850 miles long and a main highway of transport.

2 : *152*, 211

rhinoceros, a large hoofed MAMMAL with a tough, thick

skin. There are five kinds of rhinoceros. Those of Africa and Sumatra have two horns on the snout, while the Indian rhinoceros has only one.

1 : 27–28, *29*

Rhode Island Red, one of a breed of single-combed domestic fowls, originating in America. They have a long, heavy body, smooth yellow or reddish legs, and reddish feathers, with a black tail. 1 : 360

Rhodes, Cecil John, emigrated to South Africa where he made a fortune in diamonds. He was Prime Minister of Cape Province from 1890 to 1896. Both as pioneer and statesman Rhodes extended Britain's power and influence in Africa, and on his death provided a number of splendid scholarships to Oxford University open to students from the colonies and nations of the British Commonwealth, the United States and Germany. He lived from 1853 to 1902.

3 : *332*, 333–335

Rhodesia and Nyasaland, a Federation comprising the self-governing colony of Southern Rhodesia and the protectorates of Northern Rhodesia and Nyasaland. The Rhodesias are named after Cecil RHODES, the explorer and statesman. The capital of the Federation is Salisbury in Southern Rhodesia.

2 : *154–155*

ribs, a number of curved bones in men and animals, that form a framework to protect the internal organs of the chest. They are joined to the backbone and to the breastbone. See also SKELETON. 1 : 366, 374

rice, a grain crop and the chief food of eastern countries, especially suited for cultivation in monsoon conditions.

2 : 237, 309–312, *313* ; 1 : 327

Richard I, the Lionheart, the English leader in a CRUSADE against the Saracens. He was

captured in Austria on the way home and later ransomed. He reigned from 1189 to 1199. See BLONDEL. 3 : 89–90, 342

Richard II, had courage and learning, but, lacking decision at critical moments, was made to give up the throne by his cousin, Henry of Lancaster. He reigned from 1377 to 1399.

3 : 138–140, 343

Richard III, became regent, and later king on the death of the 13-year-old EDWARD V in the

Tower. He was defeated and slain by the Lancastrians at the Battle of Bosworth, which ended the Wars of the ROSES. He reigned from 1483 to 1485.
3 : 150, 342

riding, the art of horsemanship, by which is usually meant hacking—cross-country riding on horseback for pleasure. The main points about riding are embodied in this verse:

Your head and your heart keep up ;
Your hands and your heels keep down.
Your knees keep close to your horse's side,
Your elbows close to your own. **6** : 272–273, *281*

Ridley, Bishop, see REFORMATION.

Rimsky-Korsakov, Nikolai, a Russian composer who lived from 1844 to 1908. He was a keen student of the folk songs of his country, and adapted the tunes freely in some of his compositions. He wrote fifteen operas, the best known of which are probably *The Snow Maiden* and *Ivan the Terrible.* His most popular piece of music is undoubtedly *The Flight of the Bumble-bee,* which has been "arranged" for many musical instruments. **5** : 224

Rio de Janeiro, the chief seaport and former capital of Brazil. The population is nearly 3 millions. **2** : *165*

river, a channel of water winding its way to lower levels until it reaches the sea. Together with the rivulets and streams that flow into it, a river forms a natural system by which the water which falls as rain (or such of it as does not evaporate) gets drained off the land into the sea. This water carves out its own river-bed through the centuries, wearing away earth and rocks and carrying the sediment to the sea. **2** : 65, 99

river craft, barges, pleasure-boats, police launches, etc., that are found on big rivers.
4 : 194–196, *197*

river police, a section of the police force equipped with small, fast launches, for patrolling the river and protecting ships and warehouses. **4** : 195

road, a man-made, specially built path to enable VEHICLES and people to go from place to place. **4** : 189–190

Roman roads (**3** : 24–25) have lasted for many centuries, being well-made and straight.

road signs, traffic signs or warning notices are to be found on most roads for the safety and guidance of all users of the roads. These lettered and pictorial signs are issued by the Government, and failure to obey some of the directions constitutes a legal offence. All boys and girls, whether they are cyclists or pedestrians, should be familiar with, at least, the more important signs and their meanings, for their own protection.
4 : 189–190 ; **6** : 242

Robbia, Luca della, see SCULPTURE.

Robin Hood, an outlaw of the reign of Richard I, who became a popular hero by robbing the rich to give to the poor —or so it was said. His adventures in Sherwood Forest with his famous companions, Friar Tuck, Little John and Maid Marian, were made into BALLADS and so became part of English legend. See also MYTHS AND LEGENDS. **5** : *20*, 21–23

robin redbreast, a delightful bird to study as he tolerates

the presence of human beings, who dig their gardens and so turn up the insects and grubs for which he has a very keen eye.
1 : *78*, 80–81, 83–86, 306

"Robinson Crusoe," see DEFOE.

rock, the solid matter of the earth. Some rocks like basalt and granite are of volcanic origin—"cooked" hard in the earth. Softer rocks like sandstone and shale were made of muddy sediments that got squeezed and compressed after some upheaval had thrust other matter on top. A third type of rock has been changed from one kind into another. **2** : 102–105

rock-collecting, finding and displaying specimens of different sorts of mineral is a hobby that makes you interested in geology, the science of rocks.
5 : *317*, 325–326

rocket, a tube sealed at one end and with a quick-burning fuel inside, which acts like a slow explosion and pushes the rocket through the air.
4 : 115–116, *121–123*

rocket airliner, a step or two beyond the jet propulsion aeroplanes of today, but perhaps you will fly in one yet. **4** : *2*

rock lobster, or sea crawfish, a spiny lobster belonging to the group of CRUSTACEANS. They lack the powerful pincer claws of the common lobster, but instead have sharp spines on the shell as defensive armament. They have very long feelers, or antennae, with which they sense the presence of an enemy. The *langouste* of the French coast is the best-known and greatly valued as food. **1** : 161

Rocky Mountains, a great range on the western side of North America, stretching from Alaska to Mexico. **2** : *162*, 178

rodents, or gnawing animals, a large group of MAMMALS. They include the BEAVER, MOUSE, RAT, SQUIRREL and VOLE, among others, and have front teeth which need, by constant use, to be kept from growing too long. **1** : 37–40, *41*, 43

Rodin, Auguste, a French sculptor, who lived from 1840 to 1917. He brought impressionism and a vividness into his statues that has well been described as "sudden glimpses of real people." *The Thinker* is probably his most famous work.
5 : 179

roller, any heavy cylinder used by gardeners or farmers for rolling ground flat. **4** : 16–17

Alternatively it can be a device for enabling big slabs of stone, etc. to be moved, as when they are pulled over a series of smooth logs, the logs acting as rollers.

Roman Catholic Church, the world-wide church which is governed by the Pope. He is regarded as the successor of St. Peter, whom, Roman Catholics believe, Jesus Christ appointed the visible Head of His Church. Its headquarters are in Rome.
3 : 39, 60, 88, 109–114

Roman drama learned much from the GREEK DRAMA which preceded it. The Romans built semi-circular open-air arenas like the Greeks, but more elaborate. **5** : 76–77

Romans, Ancient, people who founded on the Tiber in Italy the city of Rome that became famous for its warriors and conquered neighbouring regions. They eventually built an empire that embraced the lands all round the Mediterranean, and extended even to Britain. But they had to struggle against the Phoenician city of Carthage in north Africa. The Phoenicians were great seamen and from their home in Lebanon they had set up great trading cities around the Mediterranean. The famous Carthaginian general, Hannibal, actually invaded Italy by passing through Spain, Gaul (France) and across the Alps, but later Carthage was destroyed. Julius CAESAR, a great general, conquered Gaul and visited Britain. His nephew Octavius became the first Roman Emperor and later emperors took the title of Caesar. JESUS CHRIST was born in a Roman colony in Palestine, and Christianity began to spread throughout Rome. Nero, an emperor who turned tyrant, persecuted the early Christians, accusing them of setting fire to the city. The Christians had also to struggle against the worshippers of Mithras, originally a Persian god and very popular with Roman soldiers. Temples to Mithras are found in many parts of the Roman empire.

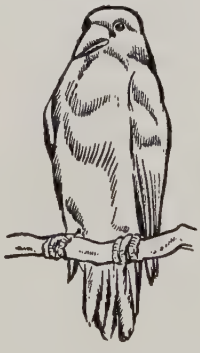
In the 5th century A.D. the barbarian tribes around the borders of the Roman Empire became too strong and Rome was overrun and overthrown by the waves of Goths, Huns, Vandals, Franks and Saxons. Thus the Roman empire fell and new nations grew up to take its place. Less artistic than the GREEKS, the Romans were great lawgivers, soldiers, builders and road-makers. Among their writers, Virgil (lived 70–19 B.C.) is one of the best known. He wrote the *Aeneid*, a poem about the wanderings of Aeneas and the founding of Rome.
3 : 17–26, 32 ; **5** : 9–10, 13–14 ; **6** : *390*

Roman villa, residence of a Roman citizen or officer or settler in Britain. **3** : *19*, 23–26

Rome, the capital of Italy. The population is nearly 2 million. It was once the centre of the Roman Empire. See ROMANS. **2** : *152*

Röntgen, Wilhelm Konrad, the German discoverer of X-rays, which pass through most solid matter that light rays cannot penetrate and so can be used to photograph more or less distinctly the bones and organs of the human body—a great aid to medical science. He lived from 1845 to 1923.
3 : 380 ; **4** : 345–346

rook, a common glossy black bird, about the size of a crow.



It has a loud coarse cry. Rooks nest in colonies, or rookeries, building high in the trees.
1 : 346

Roosevelt, Franklin D., the President of the United States of America from 1932 to 1945. He directed the American effort during World War II, but died suddenly when victory was in sight. From the age of 40 he was crippled by poliomyelitis.
3 : 355

root, the part of a plant that grows underground, and fixes the plant in the soil. Through the root-hairs, roots absorb

water and minerals from the soil which the plant needs in order to make its own food by PHOTOSYNTHESIS. They sometimes serve as food-storage organs, as, for example, the TAP-ROOT of the turnip.
1 : 11–12, 227–230, *233*

rose, the flower of a prickly-stemmed bush, yellow, white, red or pink, usually scented. There are wild and cultivated roses of many kinds. **1** : 209

rosechafer, see INSECT PESTS.

Rose of Jericho, a small ANNUAL plant of desert places, found from Algeria to Syria. When dry it rolls up, only unrolling again when it is moist. See also DESERT PLANTS.
1 : 269

Roses, Wars of the, a thirty-year struggle for the English throne between the House of Lancaster (HENRY VI) and the House of York (EDWARD IV and later RICHARD III, who usurped the throne from his nephew, the son of Edward IV). Eventually Henry Tudor, a relative of the Lancasters, defeated Richard III at the Battle of Bosworth in 1485 and was crowned king as Henry VII on the battlefield.
3 : 147–153, *151*

The name comes from the badges adopted by the warring sides—a red rose for Lancaster and a white one for York. The Tudor Rose is a combination of the two.

Ross, Sir John, a British explorer and discoverer of the Antarctic Continent. He lived from 1777 to 1856. **3** : 339

Rossini, Gioacchino Antonio, an Italian composer of melodious operas including *The*

Barber of Seville and *William Tell*. He lived from 1792 to 1868. **5** : 242, 244

rotation of crops, a scheme of cultivation widely used by farmers whereby a number of different crops are sown in succession on the same piece of land, before it is again planted with the original crop. This helps to enrich the soil by making different kinds of demands on it. A root crop, such as turnips or swedes, might be sown during the first season ; this is followed by a grain crop, such as wheat, oats or barley ; next time peas or clover ; and finally the field might lie fallow (with nothing growing on it) for a season before beginning all over again with another root crop. **1** : 329

rotifer, a tiny animal found in great numbers in stagnant pond water. Seen under the microscope it reveals a ring of delicate hairs which by moving rapidly make it appear as if the animal has a wheel at the end of its body. This accounts for its popular name of "wheel-animal." **1** : 226

rounders, a nine-a-side team game played with a small firm leather-covered ball and an 18-inch round stick as bat. To score, the player has to run round all the four bases. **6** : 274–276

Roundheads, see CIVIL WAR.

roundworm, or threadworm, a common PARASITE living in animals and man. See also WORMS. **1** : 275

rubber, a flexible, waterproof substance made from the milky juice of certain tropical plants and trees. The process by which rubber is hardened is called vulcanizing. **1** : 327 ; **4** : 273–278, *272* ; **2** : 342–346 ; **3** : 328–329

Rubens, Peter Paul, a Flemish painter, whose paintings are full of rich colour and vigorous, robust and buxom people. As well as portraits he painted Biblical scenes. He lived from 1577 to 1640. **5** : 145–147

Rugby football, a winter outdoor ball game which started at Rugby School in 1832. There are two distinct forms of the game today—Union and League. Rugby Union is played with 15 players on each side, all amateurs. The game is played with an oval leather ball, and the object is to get the ball over the opponents' goal-line, thus scoring a "try." A try counts 3 points, and if this is "converted"—that is, the ball is kicked between the posts and over the crossbar—a further 2 points are added to the score.

The "scrum" consists of the 8 forwards locking together and pushing against the opposing forwards to gain possession of the ball.

Rugby League is a similar game, but the sides consist of 13 players each. Scoring is the same except for goals from a penalty kick or drop kick which only count 2 points each instead of 3. **6** : 276–284

Ruhr, Germany's richest coal-mining and steel-making area, lying near the Rhine in Westphalia. Its principal city, Essen, has about 4½ million inhabitants. The River Ruhr, a Rhine tributary, gives the district its name. **2** : 211

Rumania, a country of south-east Europe adjoining Russia. It is noted for its oil and mineral resources. The DANUBE forms part of the southern boundaries. The capital is Bucharest. **2** : *152–153*

running, see ATHLETICS.

Russia, the Union of Soviet Socialist Republics (U.S.S.R.), or Soviet Union, a vast country covering one-sixth of the earth's surface, partly in Asia and partly in Europe. Much of it is pine forest but it has huge farms and industries owned by the state, and ample deposits of coal, iron, precious metals and oil. Like the U.S.A., it can supply almost all its needs from within its own territories.

Russia for centuries was ruled by powerful Tsars, among whom may be mentioned Ivan the Terrible (lived 1530 to 1584), a man who in his latter years lost all self-restraint, fought fierce wars and killed his own son. The rule of the Tsars was brought to an end in 1917, when the Russian Revolution broke out (**3** : 351). The reigning Tsar was executed and the Communists seized power, setting up a system of rule by Soviets, or Councils. The leaders of this movement were LENIN and Trotsky. Later, power passed into the hands of STALIN, who built Russia into a great nation. Its capital and centre of the transport system is MOSCOW,

containing the famous Kremlin, the seat of government. **2** : 243–247

rust, results when iron or steel combines with the oxygen of the air to form iron oxide. See CHEMICAL CHANGES. **4** : 45–46

S

sabre-toothed tiger, a flesh-eating MAMMAL of long ago. It had two very large fangs growing down from its upper jaw. **1** : *284*, 287

Sadler's Wells, old-established London theatre famed for Shakespearian revivals until in our own century it became, under the management of Lilian Baylis, the home of Ninette de Valois' Ballet School, which developed into a national British BALLET company. **5** : 269, 280, *273*, *276*

Sahara, the world's largest desert, extending across the greater part of North Africa. **2** : 30, *154*

sailing, the art of using the wind to drive a boat, and especially of judging how to set the sail so that a wind blowing from any direction will still send your boat in the direction in which you want it to go. A sailing dinghy is best for beginners. **6** : 284–287, *299*

St. John Ambulance Brigade, a modern organization for tending those who fall ill, taking its inspiration from the Knights of St. John who did this for the Crusaders during the CRUSADES. **3** : 89

St. Lawrence, a river of North America 2,000 miles long; in this river and through many locks runs the St. Lawrence Seaway, connecting the GREAT LAKES with the Atlantic Ocean. **2** : *162*, 330

Saint Paul's Cathedral, a famous London building built by Sir Christopher Wren. Inside the dome is a round gallery, around which whispers travel easily. **4** : 372

Saladin, see CRUSADES.

salamander, a tailed AMPHIBIAN, very like the earliest creatures to become air-breathing. A NEWT is a form of salamander. **1** : *148*, 150–152, 326

saliva, the fluid which forms in the mouth, serving to moisten the mouth and to help in the digestion of food. **1** : 362

salmon, a fish which, when mature, enters a river to lay its eggs in the shallow sandy streams near the source. When hatched the tiny leaf-like alevins grow into four-inch long prettily-marked parr, which descend the river to the sea, when they turn into silvery smolt. The salmon lives most of its life in the sea, feeding on shrimps and prawns, and acquiring its pink flesh and delicate flavour. Then at four to five years old and weighing anything from 5 to 20 or 30 lb., it returns to the river of its birth, there to spawn and soon to die. **1** : 178–180

salt, a white or colourless crystalline substance which is commonly used in cooking food to bring out the flavour. **1** : 364

saprophyte, a plant that cannot make its own food because it lacks chlorophyll, and feeds instead on non-living matter. See MOULD. **1** : 264

Sargasso Sea, a part of the North Atlantic Ocean where drifting matter carried by ocean CURRENTS collects. **2** : 116

Saturn, see SOLAR SYSTEM.

Saudi Arabia, the largest country in south-west ASIA between the Red Sea and the Persian Gulf. The chief towns are Riyadh, the capital, Medina and Mecca. **2** : *158–159*

savanna, the type of grassland found in the tropics, especially in Africa and South America. See also PAMPAS, PRAIRIES, STEPPES, VELDT. **2** : 25

Savery, Thomas, a 17th-century British inventor of an early steam engine used for pumping water. **4** : 105

sawfish, a huge fish with a gristle skeleton at its snout which sticks out as a flat, saw-like structure. **1** : 169

sawfly, see INSECT PESTS.

saw-mill, a building which houses power-driven, circular saws for cutting logs into planks. **4** : 248

Saxons, see ANGLO-SAXONS.

scab, the dry crust which forms over a healing sore or wound. **1** : 369, 376

Scandinavia, a peninsula of north-west Europe comprising Norway, Sweden and Denmark. Finland and Iceland are sometimes included in this definition. **2** : *152*

scarab beetle, see BEETLE.

Scarlatti, Alessandro, an Italian composer who wrote many operas. He lived from 1660 to 1725. **5** : 243

His son, Domenico, won fame as a composer of sonatas for the harpsichord. He lived from 1685 to 1757.

"Scholarship," an old name for the Selection Examination taken by most boys and girls in Britain at about the age of 11. **3** : 376, 379

Specimen tests, with answers, for this examination are given (**6** : 163–189).

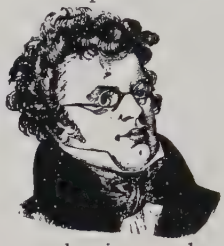
school, the means by which young people are taught to read, write and count, etc., so that they are enabled to gain further knowledge for themselves and to take part in the work of society.

3 : 99–100, 292–297, 376–379

There are several kinds of school in Britain nowadays (**3** : 378–379) and these we attend according to our age, our needs, and our special abilities.

It was only in 1870 that Parliament decided that all children in Britain ought to go to school. Education in the past tended to be for the few. See POUNDS.

Schubert, Franz Peter, Austrian composer who wrote



nine symphonies and much CHAMBER MUSIC. Romantic in spirit, his music is full of the most sweet and tuneful melodies, and his many songs are among the world's most precious. He lived from 1797 to 1828. **5** : 239, *248*

Schumann, Robert Alexander, a German composer particularly noted for his piano music. He lived from 1810 to 1856. **5** : 233, 240, *248*

science, the discovery, collecting and testing of facts about any given subject, and their orderly presentation. From these facts, certain principles may be deduced. **4** : 9–383

Scotland, the northern part of Great Britain, consists of four physical divisions, the Highlands, Lowlands, Southern Uplands and Western Isles. The Highlands are noted for their mountains and lochs, the Lowlands contain the chief industrial centres, and the Southern Uplands are mainly agricultural. The chief towns are EDINBURGH, the capital, GLASGOW, Dundee, and Aberdeen. **2** : *150–151*

Scotland Yard, the headquarters of the London POLICE force and Criminal Investigation Department. **3** : 374–375

Scots pine, the only representative of the pine tree growing wild in Britain. It carries needle-leaves on short shoots, and scale-leaves on long shoots. **1** : 258

Scott, Captain Robert Falcon, the Antarctic explorer who reached the South Pole just after it had been reached by AMUNDSEN, and perished on the return journey, his diary being

later recovered. He lived from 1868 to 1912. **3** : 339–340

Scott, Sir Walter, the first great novelist in Britain to popularise history by writing novels about the past. A Scotsman, he made known to a wide audience the romantic side of Scotland and the life of the

clans. In his day he was equally famous for his long narrative poems, as vigorous and full of incident as his novels. He lived from 1771 to 1832.

5 : 25, *56*, 57–58, 99

Scout, a member of the movement started by Lord BADEN-POWELL to educate boys

and girls through woodcraft and training to be observant and self-reliant. Such training will help them to become good citizens as they grow older. See also GIRL GUIDE. **3** : 347, *349*

scrapbook, an album into which is pasted a varied collection of pictures from books, magazines, newspapers, etc., possibly on some subject that has interested us, and about which we want to know more. Keeping a scrapbook in this sense may be one of our hobbies.

5 : *286*, 293

screw, a special nail with a spiral thread round it. **4** : 25

Scripture, a general name for the writings published together in the BIBLE, and the name of the school subject which introduces children to Christian teachings.

6 : 190–211

sculpture, the representation of persons or objects usually by carving their shapes out of wood or stone, or modelling them in clay, etc.

5 : 166–168, *176*

Where PAINTING has only length and breadth (**5** : 109–166) sculpture has thickness as well. Carving is very old (**5** : 170) : pre-historic man probably thought he gained magical power by carving or painting the animals he hunted. Ancient civilizations, such as that of the ancient Egyptians which produced this beautiful head of

Queen Nefertiti, as well as our own used sculpture to decorate their cities and buildings (**5** : 171). See also FRIEZE.

The Greeks (**5** : 171, 174) idealized the human form, seeking to express beauty, grace and harmony rather than character. They coloured many of their statues (**5** : 168).

But most sculptors have preferred to show the beauty of the stone or wood untouched by paint. Beautiful effects, however, were produced by the colour glazing of clay sculpture, especially the reliefs of the 15th-century Florentine sculptor, Luca della Robbia. (**5** : *176*)

sea-anemone, a small animal which clings to the rocks in shallow waters around the coast. It looks like a plant with a fringe of feelers around the top. These have small threads that sting the tiny, unwary fish that are its prey. **1** : 156, *157*, 274

sea-dragon, see SEA-HORSE.

sea-hare, one of the animals without backbones that belongs to the group of MOLLUSCS. It is about six inches long. The muscular foot typical of the molluscs has developed in the sea-hare into swimming "paddles." **1** : 159

sea-horse, a small fish belonging to the group that includes the PIPEFISH. It has jointed armour, and a long, tube-like snout. It usually keeps its body in an upright position when swimming, and can curl its tail round the weeds in the sea. The male has a pouch on the underside in which the eggs are kept safe until they hatch.

1 : 173–174, *175*

seal, a sea MAMMAL with webbed feet, or flippers, that are long and fin-like in shape. It is usually found in coastal waters, especially in the colder parts of the world, among or near ice. It is different from its relative, the sea-lion, in being unable to use its hind limbs to move about on land. Instead it pushes itself along by the muscular action of its body, aided by movement of the front flippers only. There is no outwardly visible sign of its internal ears. Seals are hunted for their fur, hide, oil, and for their flesh.

1 : 308–309 ; **2** : 62

sea-lion, a sea MAMMAL related to the seal but differing from it in various ways. Sea-lions can turn the hind limbs, or flippers, forward and raise themselves on both pairs of limbs to move about on land. They also have external ears that are clearly visible ; for this reason sea-lions are known also as eared seals. They are often seen in circuses, balancing balls on their noses. **1** : 306 ; **2** : 62

sea mouse, a bristle worm, one of the animals without backbones that live in the sea. It is oval in shape and about 9 inches long. There are many kinds of bristle worm, but the

sea mouse is probably the most unusual in appearance, for the upper surface of its body is covered with fine bristles which make it look like a furry animal. **1** : *19*

sea-plane, a type of aeroplane having floats instead of wheels. These enable it to float on the water. See also FLYING-BOAT. **4** : 240

searchlight, an electric lamp with a powerful reflector which can send a beam of light through the sky. **4** : 308, 310

sea-shells, the empty shells of sea animals, such as periwinkles, whelks and limpets. They are often found on the sea-shore and in rock pools at low tide. They are the protective shell enclosing the soft-bodied animals belonging to the group of MOLLUSCS.

1 : 17–18, 153–156, *157*, 159

sea-shore, the sea coast, the land along the edge of the sea. **1** : 153–156, *157*, 159

sea-snake, one of several kinds of poisonous snakes that live mainly in the Indian and Pacific oceans. The tail is flattened and can be used as a rudder. **1** : *135*

sea-urchin, a small animal related to the starfish. It is covered with spines and lives at the bottom of the sea between rocks. **1** : *158*, 161

seaside, a favourite place in summer for all who live near enough to the sea to visit it. **6** : *78*, 79–81

seasons, the periods of a year during which conditions of CLIMATE are of a uniform nature. The number and duration of such periods varies according to the parts of the world in which they exist. **2** : *368*

Sedan-chair, a chair enclosed like a little cabin, mounted on poles and carried by two men. It was a fashionable means of transport for ladies in Georgian times. **3** : 239

seed, the fertilized egg-cell, or ovule, from which a new plant can grow. A seed needs air, warmth and moisture if it is to grow. When it is ripe, the seed swells and the seed-coat bursts. The young root pushes its way out and grows down in the soil, and the young shoot pushes its way out and grows upwards towards the light. The development of a seed into a seedling is called germination. Seeds are scattered in various ways, such as being jerked out of pods which burst open, or carried by the wind, or caught up in the coats of furry animals.

1 : 231, *233–234*, 235–239

Segovia, Andrés, a Spanish guitarist, born in 1894. This self-taught musician was the first to develop the full possibilities of the Spanish guitar as a concert instrument, and his tremendous example as a player and interpreter of music for this instrument has inspired a world-wide interest in the guitar among musicians. **5** : 262

Selection Examination, the written test taken by most children in Britain at about the age of 11. It includes questions in Arithmetic, English and Intelligence, and its purpose is to help the education authorities to decide which type of school the pupil should go to next. **3** : 378–379

Selection Examination Tests are given in this book (**6** : 163–189), to be worked out by pupils who would like to test themselves. If you work through all ten sets of Questions and Answers you may greatly improve your examination prospects by the practice you are thus getting.

semaphore, a means of sending messages by signalling in code. **4** : 164

senses, the organs in the body which receive stimuli from the outer world and pass messages by different NERVES to the brain. In this way we are able to see, hear, feel, taste and smell. **1** : 376–383

sepal, one of the green, petal-shaped leaves growing from the base, or receptacle, of a flower-head, to protect the bud. The sepals are together known as the calyx. **1** : 232

Seven Wonders of the World, the architectural masterpieces so admired in ancient times. They were the tomb of Mausolus at Halicarnassus, the Colossus of Rhodes, the light-house at Alexandria, the Pyramids of Egypt, the Hanging Gardens of Babylon, the Temple of Diana at Ephesus, the Statue of ZEUS at Olympia. They have all disappeared except the Pyramids. **6** : *318*

Sewell, Anna, the author of *Black Beauty*, the story of a horse. She lived from 1820 to 1878. **5** : 32

sextant, a navigation instrument which helps a ship at sea to find out its position. See also LATITUDE. **4** : 212 ; **2** : 143

sexton beetle, see BEETLE.

Shackleton, Sir Ernest Henry, a British Antarctic explorer who lived from 1874 to 1922. **3** : 339

shadow, caused when light rays striking a surface are partly blocked by the shape of a solid object coming between the surface and the source of light. **4** : 336

shadow show, done by means of a frame covered with a piece of white sheet stretched tightly across and tacked down. Behind this is placed a light and against the screen small, cut-out cardboard figures move in SILHOUETTE. This is easier to make and work than the TOY THEATRE, with which it can be compared. **5** : 367–371

Shaftesbury, Anthony Ashley Cooper, Earl of, the British statesman who did much to make life more bearable for the poor and founded the "Ragged Schools." He lived from 1801 to 1885. See also POUNDS. **3** : 281, 290–291

Shakespeare, William, the greatest figure in English literature, being poet as well as dramatist and producing tragedies, comedies, romances and histories, based on tales drawn from many sources and

set in many countries. Of his immense gallery of characters, Hamlet, Macbeth, King Lear, Romeo and Juliet are more real to the public than the kings and prime ministers of their own time, and three and a half centuries after his death nearly all his plays are still being staged. He lived from 1564 to 1616. **5** : 91–97, *95*

shamrock, a three-leaved clover, the emblem of Ireland. **3** : 37

Shanghai, largest city in China and one of the chief ports. Tea, rice, silk and cotton are important exports. **2** : 249–250

shark, a fish that has a skeleton of GRISTLE instead of bone. The skin is covered with small, sharp spines, instead of scales, and the mouth is on the underside of the head. Most of them are flesh-eaters, and are sometimes dangerous to swimmers. The dogfish is a small, harmless shark found in British waters. **1** : 166–168

Shaw, George Bernard, an Irish journalist and socialist who

became the most original dramatist of our century. Mainly a writer of comedies, he made his characters stand for different views on subjects of great controversy so that his plays have the excitement of arguments : there is a battle of ideas and of wits. Shaw has proved that plays in which ideas are more important than the story can be as interesting as any and more lively than most. But few writers are witty enough to follow his example. Among his best works are *Man and Superman, Caesar and Cleopatra, Pygmalion, The Doctor's Dilemma, Back to Methuselah, Major Barbara,* and the tragedy *St. Joan.* He lived from 1856 to 1950. **5** : 91–93, 165

sheep, a domestic animal related to the goat. It is raised for its wool and its flesh (mutton). **1** : 313–315, 338–340, 350, 352–353, 359–360

Sheep-rearing (**2** : 313–314, 319, 336, 338–340) is carried on in various parts of the world, sometimes on a tremendous scale. This is especially true of Australia, New Zealand and the pampas of South America.

shells, the hard outer covering in which a MOLLUSC lives. There are two main kinds : single shells, or univalves, which usually grow in a spiral shape, and hinged shells, or bivalves. There are sea molluscs and freshwater molluscs and molluscs, like the garden snail, which live on land. Each has its own distinctive shell ; the collecting of these makes a very interesting hobby. **5** : *320*, 322–323 ; **1** : 156

Sheraton, Thomas, a cabinet-maker by trade, became one of the most famous designers of English furniture. He lived from 1751 to 1806. **3** : 239

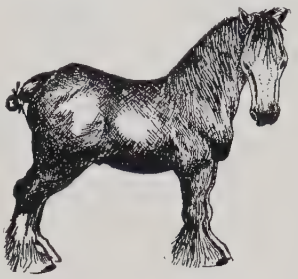
shin-bone, the front of the leg-bone from knee to ankle. **1** : 373

shipbuilding, a great British industry, carried on mainly on the Clyde near Glasgow, the Tyne and towns nearby and at Belfast in Northern Ireland. **2** : 252, 288–292, *259*

ships, large floating vessels of many kinds. **3** : 269–270 ; **4** : 196–211

They include LINERS, TRAMP STEAMERS, TANKERS that sail the world's oceans; TUG-BOATS for docking larger vessels, BARGES and various other RIVER CRAFT ; warships of many kinds (**4** : 206–207) from AIRCRAFT-CARRIERS to SUBMARINES ; and queer craft from the distant regions of the world (**4** : 208–209). Ships float because, although they may be made of steel, they are lighter than the weight of the water they displace (**4** : 61).

Shire horse, one of a heavy breed of cart-horse with great pulling power. They can be



distinguished by a shaggy growth of hair at each fetlock. **1** : 360

shoe-making, the fashioning of LEATHER into shoes. See also TANNERY. **4** : 321

shoot, the part of a plant that grows above ground, towards the light and air. Leaves and FLOWERS grow from the shoot. See also LEAF, SEED. **1** : 227

Shorthorn cattle, one of a large heavy breed of cattle, best known as dairy cattle, Shorthorns are bred also for beef production. **1** : 359

shoulder, the part of the body of a person or animal on each side of the neck, to which the arm is joined by means of a ball-and-socket type of joint. **1** : 374–375

shoulder-blade, the flat, triangular bone in the shoulder. **1** : 374

shrew, a small insect-eating MAMMAL with a long sensitive snout and very sharp teeth. Shrews feed every three hours, for they need a great number of insects per day. **1** : 52–53

shrimp, see CRUSTACEAN.

shrub, woody, tree-like plant or bush that is different from a tree in having many stems but no single main trunk. **1** : 248–249, 253

Sibelius, Jean, a Finnish composer whose work has received world-wide acclaim. His eight symphonies and other orchestral works are steeped in the spirit of Finland. He lived from 1865 to 1957. **5** : 239

Siberia, the northern area of Asian RUSSIA. Much of it is within the Arctic Circle. **2** : *158–159*

Siegfried, warrior-king of the lower Rhine who figures in the *Nibelungenlied,* the great story-cycle of German legend. See also WAGNER. **5** : 15

Silbury, an earth pyramid in Wiltshire, built by the Ancient Britons. **3** : 11–12

silhouette, a portrait cut out of black paper or drawn in solid black. Most silhouettes are drawn in profile, that is, as if looked at from the side. The word silhouette is also applied to the shape of anything seen as a black mass against the light, hence the figures in a SHADOW SHOW are seen in silhouette. **5** : 367–369, 371

silk, a very fine cloth woven from the thread made by the silkworm when it spins its cocoon. The silkworm is the caterpillar of the silkworm moth. **4** : 284–285

The rearing of silkworms (**5** : 315–321) makes an interesting hobby for anyone with a mulberry tree in the garden for these creatures live mainly on mulberry leaves.

silo, a tall tower made of wood, concrete, or steel, in which grain, green fodder or other crops are stored. The dried fodder is called silage. **1** : 332–333, *342*

Singapore, an island off the coast of Malaya, with a fine harbour. It is a great commercial centre. The population is over a million. **2** : *158*

singing, see SONG.

singular and plural, the difference between *man* and *men*, *stone* and *stones*, *one* and *many*. **6** : 146–147

Verbs can have singular and plural forms. One *sees* but two or more *see*. Sheila *shouts* but her mother and father *shout*. I *am* cold, but they *are* cold (**3** : 149–150).

Sioux Indians, a tribe of Redskins, or RED INDIANS, of North America. Less than a hundred years ago the American Indians often used to go on the warpath, and soldiers and cowboys sometimes joined forces to fight them. The Sioux were very good fighters. Today, the descendants of the different tribes live at peace in Indian reservations in the United States and in Canada. **1** : 310, *311*, 313

siphon, a tube placed so that air pressure causes the liquid in a container to pass up the tube over the rim and down the other side. **4** : 364

skate, a fish with a skeleton of GRISTLE instead of bone, closely related to the shark. Skates and rays both live mainly on the sea-bed, and their bodies have become flattened, while the fins have grown very large so that the fish look almost triangular in shape. **1** : 168–169

skating, the sport of moving swiftly and gracefully over a sheet of ice on thin steel blades fixed to the skater's boots ; or over any smooth surface on roller skates with small metal or rubber-shod wheels. Skating competitions include dancing, racing and cutting figures. **6** : *282*, 287–288

skeleton, the hard framework of an animal which serves to support the body and to protect the internal organs. The skeleton is formed of separate units joined together. Vertebrates have an internal skeleton made of bone. Invertebrates, such as the crustaceans, have an external skeleton made of a hard substance called chitin. See also JOINTS and MUSCLES. **1** : 374

skiing, the sport of gliding over snow-covered ground on strips of wood called skis, 5 inches wide and about 6 to 7 feet long, which are strapped to the boots of the skier, who uses also a stick in each hand to help to push himself along. **6** : *282*, 288–289

skin, the outer covering of human beings and other animals. It may be bare, or covered with hair, feathers or scales. **1** : 368–372, 376

skipping, an exercise which helps to make one strong and graceful. It is suitable for boys and girls and is much practised by boxers to keep them agile. There is fast skipping and slow skipping, and many other varieties which arise from different steps and timing. **6** : *212*, 289–291

skittles, see NINEPINS.

skull, the bony case which surrounds and protects the BRAIN and the main sense organs, and also supports the jaws. **1** : 374, 376

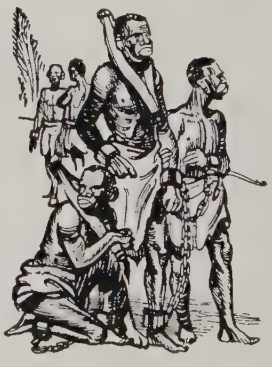
skunk, a flesh-eating MAMMAL related to the weasel ; it is found in America. Its food includes insects and fruit as well as mice and other small animals. When alarmed it squirts out a horrible fluid that all animals dislike because of its dreadful smell. **1** : 50, 296–297

skylark, a bird of the open fields that nests in the grass. The singing of the skylarks as they ascend higher and higher into the sky is a feature of Britain in spring and early summer. **1** : 92

skyscraper, a tall steel-framed building of up to eighty

or more storeys. They are mostly to be found in New York and other American cities. **4** : *312*, 315; **5** : 219; **2** : 185

slavery, a state in which human beings could be bought and sold and their owners have complete power over them. Of old, prisoners captured in war



became slaves of the victors. Slavery was ended in the British Empire in 1833, after a long campaign against it led by William WILBERFORCE. **3** : 273–274, *275*, 330

slipper animal, see PARAMECIUM.

sloth, a mammal of Central and South America that belongs

to the same group as the anteater and the armadillo. It has no front teeth, and feeds on the leaves of the trees in which it lives. Its feet are armed with strong, curved claws with which it clings to a branch, hanging upside down. **1** : 52

The megatherium (**1** : 287) was a giant ground sloth that lived thousands of years ago.

Smuts, Jan Christiaan, a Prime Minister of South Africa, who had fought against the British in the Boer War (see SOUTH AFRICA) but who later came to value the advantage of membership of the BRITISH COMMONWEALTH. **3** : 314–315

snail, see MOLLUSCS.

snake, one of the REPTILES, without eyelids and without legs. The tips of the snake's many ribs fit into scales which protrude slightly along the underside of the body, and these push the creature along as a sort of wave-like motion passes down the body. The mouth can open so wide as to swallow prey much bigger than the head. The snake has a forked tongue, and some snakes have poison fangs with which they inject venom when they bite.

1 : 15, 125–131, *135*, 278

The adder (**1** : 125–126), common in Britain and Europe, is poisonous. It is distinguished from the harmless grass snake (**1** : 125) by having a black zig-zag pattern down the spine, ending in a dark V mark at the back of the head.

snapdragon, or antirrhinum, a garden plant, about 15 inches high, with white, yellow or red flowers. **1** : 236

snoek, see BARRACOUTA.

Snyders, Franz, a Flemish painter who lived from 1579 to 1657. He belonged to the great Dutch and Flemish school of "photographic" painting, and his rich, bold touch is seen in the many pictures of STILL LIFE he painted. "The Rooster and the Jewel" is an example of his great skill. **5** : 133

Socrates, see GREEKS.

soda-water siphon, a bottle from which a liquid is forced out by the pressure of carbon dioxide gas. **4** : 367

solar system, the SUN and the nine PLANETS that circle round it. The names of the planets are Pluto, Neptune, Uranus, Saturn, Jupiter, Mars, Earth, Venus, and Mercury. In addition there are more than 1,500 small planets, called asteroids that revolve round the sun between the orbits of Jupiter and Mars, and several hundred COMETS. **2** : *368*, 372–375

solids, things which are neither gases nor liquids. See CHANGES OF STATE. **4** : 43

Solomon, King of Israel, after his father King David. He built the first Jewish temple, and is believed to be the author of two books in the Bible, *Proverbs* and *Song of Solomon.* **6** : 207

sonata, a musical composition for one or two instruments but usually for piano or violin. It is composed in several related parts called movements. Beethoven wrote many sonatas, among which is the *Moonlight Sonata.* See also CHAMBER MUSIC. **5** : 238–241

song, something that is sung, a series of musical sounds produced by a human being with the voice. The art of singing may have been the beginning of MUSIC, as we know it, and in every age it has been used to express some of the deepest of human feelings. **5** : 222–224

Birds are also capable of singing, and their song may have encouraged human beings to sing (**1** : 305–306).

sound, wave-like vibrations of the air or other substance which strike the ear.

4 : 369–370

Sound takes about 5 seconds to travel a mile in air but little more than 1 second to travel in water (**4** : 373).

South Africa, Republic of, which left the BRITISH COMMONWEALTH in 1961, comprises four provinces, Cape Province, Transvaal, Orange Free State and Natal. The population has five times as many coloured as white people. Gold, diamonds, wool and much fruit are produced there. The Parliament building is at CAPE TOWN, the administrative buildings at PRETORIA.

2 : 154–155, 230–233, 347, 351

South Africa was first colonized by the Dutch, and became a British colony after the Napoleonic wars. The BOERS were not satisfied with British rule, and fought against it in 1899. Although the Afrikaners, or Dutch section of the population have since lived at peace with the British settlers, they have kept their own language (Afrikaans), and customs (**3** : 330–336, 362–366).

South America, one of the CONTINENTS. About two-thirds lie in the TROPICS. The following countries are found there—ARGENTINA, BOLIVIA, BRAZIL, CHILE, COLOMBIA, ECUADOR, the GUIANAS, PARAGUAY, PERU, URUGUAY, VENEZUELA.

2 : *164–165*, 177

Southampton, a large seaport and shipbuilding centre on the south coast of England.

2 : *148*

Southdown sheep, an important breed of English sheep from the south downs of Sussex and Hampshire. These animals are of medium size, short-woolled and hornless, producing excellent lamb and mutton. The fleece is fine, close and white.

1 : 353

Southern Rhodesia, see RHODESIA AND NYASALAND.

South Pole, see POLAR REGIONS.

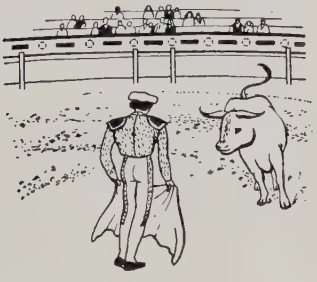
South Sea Islands, groups of islands in the South Pacific Ocean. Many of them are CORAL

formations and are inhabited by the Polynesian and Melanesian races. **2** : 255–258

space travel, an accomplished fact now that Russian and American astronauts have orbited the world. The next step will be to land a man on the moon. Space capsules containing astronauts are carried aloft by ROCKETS.

2 : 383 ; **4** : 116 ; **6** : *407*

Spain, a country to the south-west of France which forms the larger part of the IBERIAN PENINSULA. Most of the interior is a high plateau with a hot dry summer and cold winter. The chief crops are oranges, olives and the bark of cork trees, and the national



sport is bull-fighting. The capital is Madrid.

2 : *152–153*, 226–229

Spain was overrun by the Moors from North Africa in the Middle Ages. After the REFORMATION she became the leader of Catholic Europe. It was in Spain that the Inquisition became most powerful—this was a church court set up to try people accused of heresy and said to be very cruel in its method of getting people to give information and in the punishments it inflicted. Spain was the enemy of England in the time of Elizabeth I, sending an Armada to invade England. She possessed a great empire in North and South America but gradually her power grew less and all her colonies were lost in the 19th century.

sparrow, a small, brown, cheerful bird which is commonly seen in towns and cities. It belongs to the finch family. The hedge sparrow, in spite of its name, is not related to the sparrow ; it makes its nest in a bush or hedge in gardens or woods. **1** : 80–81, *95*

sparrow hawk, see HAWK.

Sparta, see GREEKS.

spatterwork, a hobby which enables you to make designs in outline from the shapes of flat objects like ferns or leaves. Of course, you can cut your own shapes and use them as

a stencil. The drawing shows you how. The white dog is made by spattering around the cut-out shape. To get the black dog you place the sheet from which the dog has been cut out over another sheet and fill in the cut-out part with black. **3** : 311

Speaker, in effect the chairman of the House of Commons. He must keep order and see that everyone obeys the rules of the House. **3** : 372–373

speech, sounds with meaning, made by human beings. We call these sounds spoken words, and a system of words understood throughout a nation we call a LANGUAGE. **4** : 9

Sphinx, a fabled animal of ancient Egypt, said to represent the power of the Pharaohs. A huge rock-carved one stands near the Pyramids. **2** : 32

spider, an animal without a backbone. It differs from INSECTS in having four pairs of legs, a body divided into two parts instead of three, and no feelers. All spiders feed upon insects but they have many different ways of catching their prey, from the silken web of the garden spider to the sunken pit of the trap-door spider. **1** : 221–223

spinal cord, the main nerve cord, protected by the BACKBONE, and running from the base of the BRAIN down the back of the body. **1** : 376–379

sponge, a very simple form of animal life, found in rivers and lakes and in seas throughout the world, from mid-tide mark to the deepest depths. It is made of a multitude of cells, some of which bear a whip-like thread by means of which a current of water is made to pass through the body, bringing in food and oxygen. When dead, the skeletons of certain of them form the sponges used in the home. **1** : *19*, 161–162, 274

spore, a cell or small group of cells with a tough outer wall. They are the means by which all non-flowering plants and certain animals are reproduced. **1** : 260–265

sports, games and activities which we do for fun, often in competition with other people. They range from athletics such as running to organized team games such as football, and embrace also outdoor activities such as cycling and swimming which we do for recreation and exercise. **6** : 213–298

spring, the gushing out of water at a point where it has collected underground, there being no other means of its soaking away. See also geyser. **2** : 93–94

spruce, a coniferous TREE with needle-like leaves, and hanging cones. This tree is traditionally called the Christmas tree. It is sometimes called the spruce-fir, but this is misleading as the firs belong to a different family. **1** : *256*, 259

spurge, one of several kinds of plant that can live in the dry conditions of the desert. See DESERT PLANTS. **1** : 267–268

square, a flat, four-sided figure with sides of equal length, and the angles made by the sides all right angles. **6** : 112

squid, an animal without a backbone, belonging to the group of MOLLUSCS that includes the cuttlefish and the octopus. The giant squid is the biggest of the INVERTEBRATES. It has 10 arms, and may be over 50 feet long. **1** : 164

squirrel, an attractive and well-known RODENT with long bushy tail, at home in the trees

where it makes its nest and lives on nuts. **1** : 39, 238

The red squirrel (**1** : *41*) is a native of North America but has close relatives all over the world. The Indian giant squirrel or Malabar squirrel (**1** : *41*) is the largest of all squirrels.

The so-called flying squirrel of Australia (**1** : 63–64) is neither squirrel nor rodent, but a pouched MAMMAL belonging to a distinct family of PHALANGERS.

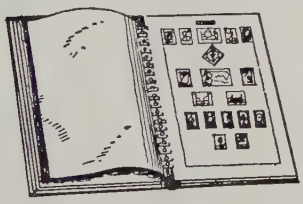
stalactites and stalagmites, limestone deposits hanging from the roof and standing on the floor of caves in which water containing dissolved limestone ROCK has been dripping and drying for many centuries. **2** : 82–86; **4** : 68

Stalin, name given to Josef Djugashvili, the leader of the Communist Party in Russia after the death of Lenin. He was a ruthless dictator, removing all possible opposition by death or imprisonment, but he organized his country successfully to repel the German invasion. **3** : 352, 355–356

stalk, see STEM.

stamen, the male reproductive organ of a plant, consisting of a long stalk, or filament, with an anther at its head. Pollen grains are produced inside the anther and when these unite with a female egg-cell a new seed is formed. See also FERTILIZATION, FLOWER, PISTIL, POLLINATION. **1** : 231–232, *233*

stamp-collecting, or philately, the hobby of making



a collection of postage stamps. Most collectors specialize in the stamps of one or other country. **3** : 298–299 ; **4** : 17; **5** : 287–289, *295*

Stanley, Henry Morton, see LIVINGSTONE.

starfish, a sea animal without a backbone. With the sea-urchin, the sea-lily and the sea-cucumber it forms the group of spiny-skinned animals which have a tough skin with hard, limy plates or short spines embedded in the upper surface. There are many kinds of starfish, of which the common five-rayed starfish is a typical example. It has a central body disk from which grow five rays, or arms. On the underside of each arm are two rows of tube-like feet with suckers at the tip. **1** : 18, *19*, *158*, 160, 275

starling, a bird with very beautiful plumage, that gathers in great flocks before roosting. **1** : 79–80, 82, *95*

stars, billions upon billions of revolving suns, many being bigger than our sun. They are to be found in vast groups called galaxies. On a clear night you can see the myriads of stars in our own galaxy. Where the stars are thickest is called the Milky Way. **2** : 375–383

The study of the stars is called astronomy. It is of great help to navigators of ships and aeroplanes. Copernicus, a Pole who lived from 1473 to 1543, was the founder of modern astronomy, when he stated that the earth moved round the sun, and not the sun round the earth. This idea was supported by Galileo (lived 1564 to 1642), an Italian who invented the telescope.

In ancient days, the study of the stars was often linked with religion. Later, people thought there was a connection between the position of the stars and events on this earth and the study of the stars for this purpose was called astrology.

statues, see SCULPTURE.

steam, the gas into which water turns when its temperature is raised to BOILING-POINT. Steam is really invisible. What we see coming from a kettle is steam condensed back into water. **4** : 43

steam-engine, a machine driven by expansion of steam. The earliest ones were used for pumping ; later ones for driving ships and trains. **4** : 104–109, *111*

It is possible to have a model steam-engine (**4** : 109). The steam-coach was the earliest land transport to use the steam-engine. Steam-rollers and steam traction-engines are still seen on the roads (**4** : 110). Many other devices from the steam hammer to the launching of aircraft from aircraft carriers (**4** : *111*) depend on steam power, while great power stations use steam power to generate ELECTRICITY (**4** : *152*).

steam-hammer, a machine for punching white-hot steel into a desired shape. A special type of steam-hammer is used as a pile-driver. **4** : 257, *111*

steam-turbine, a type of STEAM-ENGINE specially suitable to drive ships or electric generators. In this engine, steam is directed upon a many-bladed wheel or wheels so as to make them spin like mill wheels when water turns them. See also GAS TURBINE. **4** : *112*, 114–115

steel, a metal of great strength and toughness made by melting and purifying the more brittle iron and adding small amounts of other substances. **4** : *254*, 255, **2** : 212, 280–284

steel-works, the works in which iron is converted to steel and the steel made into sheets and girders, etc. **4** : *254*, 255–258

Steen, Jan, one of the "little masters" of Dutch painting. He painted many pictures of family life, bringing a humorous touch into most of his works. He lived from 1626 to 1679. **5** : 140, 232

stegosaurus, one of the DINOSAURS that lived millions of years ago, during the great Age of REPTILES. It moved about on all four feet, feeding on plants. Horny plates of armour embedded in the skin all along the backbone, and four sharp spines on the tail, helped to protect it from attacks by the flesh-eating dinosaurs. **1** : *282*

stem, the shoot of a plant that grows upwards towards the

light and bears the leaves and the FLOWER. There are also different kinds of stem that grow underground and serve as food storage organs, such as the potato tuber. **1** : 227–228, 231, *233*, 242, 247, 253

Stephen, a king of England whose reign was marked by constant civil wars with the supporters of Matilda, the daughter of Henry I. He reigned from 1135 to 1154. **3** : 342

Stephenson, George, the English engineer who made an effective steam engine on wheels, thus creating the locomotive and making the first railways possible. He lived from 1781 to 1848. **3** : 279 ; **4** : 214

steppes, the grassy plains covering huge areas of Russia. See also PAMPAS, PRAIRIES, SAVANNA and VELDT. **2** : 42

stereoscope, an instrument for giving the appearance of depth to pairs of photographs. See also THREE-DIMENSIONAL PICTURE. **4** : 335

Stevenson, Robert Louis, a Scottish romantic novelist and storyteller whose *Treasure Island* is perhaps the most exciting and best loved of all pirate stories. Another of his famous books is *Kidnapped*, in which he describes the adventures of two

friends pursued across the Scottish moors by soldiers. Stevenson fought against illness and spent the last part of his life on a South Sea island, where he died. He lived from 1850 to 1894. **5** : 61–70, 102

stick insect, an insect which lives on shrubs. By day it lies perfectly still, looking like a piece of twig, but under cover of darkness it moves about eating the leaves which form its food. **1** : 207, 299–300

stigma, a sticky knob or cap at the top of the PISTIL in a flower. It receives the POLLEN that causes the SEED to develop. **1** : 231

still life, a painting, or the type of painting, in which objects of any kind such as may be at hand in the home are arranged in a group to form a pleasant pattern. Ornaments, fruits, foods, pots, bowls, whatever will offer good contrasts of colour and shape, are arranged to be the subject of a still life picture. A special kind of still life is the FLOWER-PIECE. **5** : *135*

stoat, a slim, reddish-brown animal with short legs and black-tipped tail, which hunts rabbits, birds and other small creatures. It is about a foot long and very wiry. In winter its fur turns white and is then called ermine. Rabbits offer little resistance to the attack of stoat or weasel, acting often as though paralysed with fright. **1** : 47–48

stomach, a strong muscular bag in the upper part of the abdomen, where food is partly digested before it passes into the INTESTINES. **1** : 362, 366

stomata, a word in the plural (singular, *stoma*), meaning the breathing pores or holes in the leaves of a plant. **1** : 229, *233*

Stone Age, the period of civilization when men could make their tools and weapons only from stone—mostly chipped flints. **3** : 8–10

Stonehenge, a religious monument nearly 4,000 years old, near Salisbury. **3** : 14

stooking, standing sheaves of grain together in groups. **1** : 335

Stowe, Harriet Beecher, the American woman whose novel, *Uncle Tom's Cabin* taught many that it was wicked to maintain others in slavery, and so helped the cause of Abraham Lincoln whose freeing of the American Negro slaves was one result of the Civil War. She lived from 1811 to 1896. **5** : 52–53

Stradivarius, Antonio, see VIOLIN.

stratosphere, the region which begins about 7 miles high in the sky. There are no clouds, the air is thin, and it is very cold. **2** : 115

Strauss, Johann, an Austrian composer who lived from 1804 to 1849, known all over Europe for his waltzes. His son, Johann Strauss the younger, who lived from 1825 to 1899, won even greater fame and was called "the waltz king"—besides such enchanting waltzes as *The Blue Danube* and *Tales from the Vienna Woods* and polkas like the *Thunder and Lightning* polka, he composed 16 operettas, of which the most famous are *Die Fledermaus* (*The Bat*), and *A Night in Venice*. **5** : 284

Strauss, Richard Georg, German composer who lived from 1864 to 1949. Strauss is regarded as possibly the most successful German composer since Wagner. He also achieved fame as a conductor of OPERA. He will best be remembered, perhaps, by his symphonic poem *Till Eulenspiegel* and the opera *Der Rosenkavalier*. **5** : 239

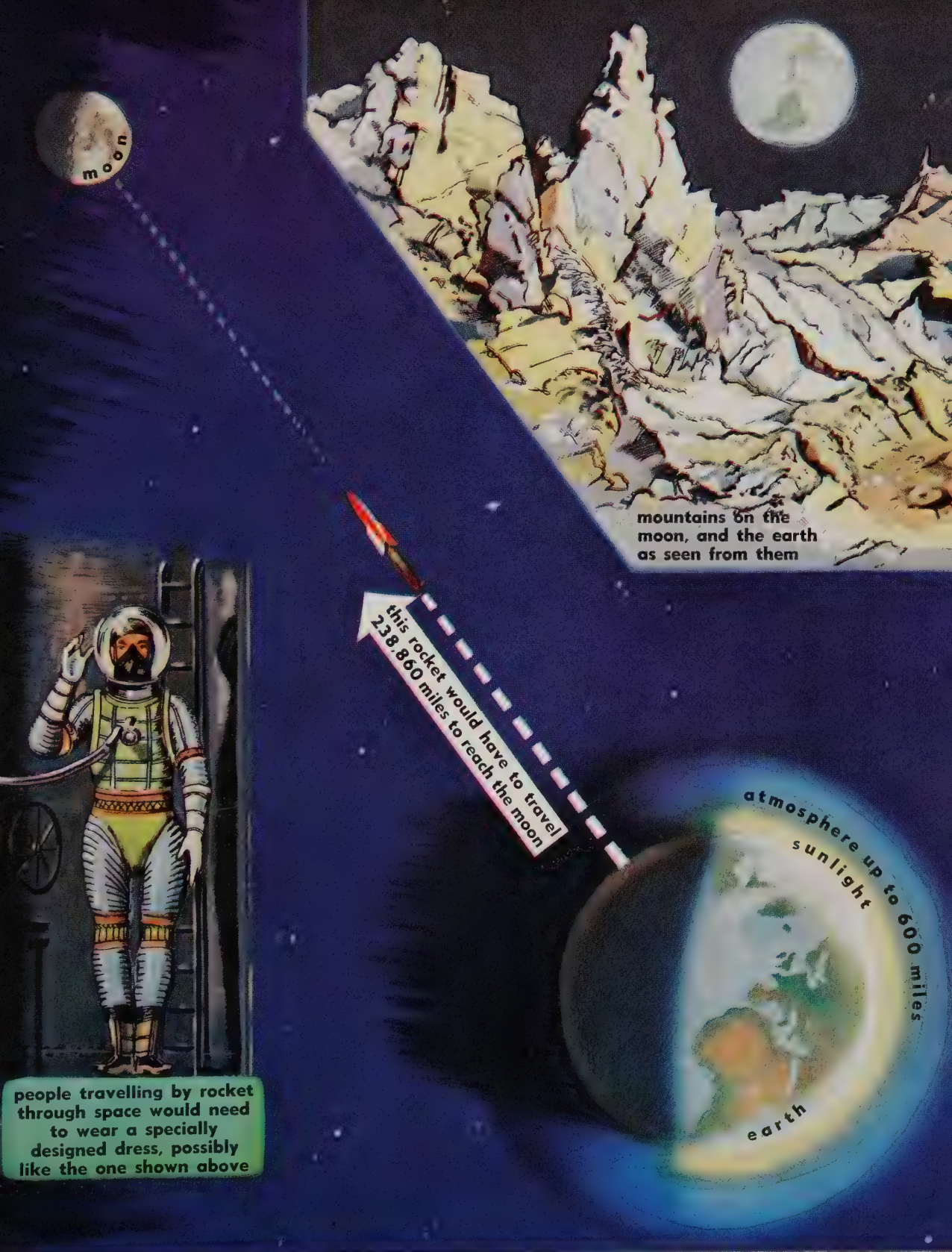
Stravinsky, Igor, a Russian composer, is best known for his superb ballet music to *Petrouchka*, *The Rite of Spring*, and *The Firebird*. He was born in 1882. **5** : 272

straw, the stalks of certain types of grass, grain, etc., after the grain has been threshed off. Straw is useful for packing purposes, bedding for cattle, hat-making, etc. **1** : 334, 338, 343, 356–357

strawberry, the red fruit of a plant which forms new plants by means of long runners. The strawberry plant has small white flowers and its juicy, eatable red fruits are highly prized. **1** : 238

stringed instruments, see ORCHESTRA.

Stuart, Prince Charles Edward, Bonnie Prince Charlie, "the Young Pretender," landed in Scotland in 1745 and raised an army in support of his father's claim to the throne of Britain. He marched as far as Derby, before retreating north to his final defeat at Culloden. The Prince escaped to France, aided



MAN'S FIRST CONQUEST OF SPACE WILL BE A JOURNEY TO THE MOON

Moses, the lawgiver of the Jews; his story is told in the Old Testament

Mohammed founded the religion called Islam, a follower of which is known as a Moslem; there are other great men of the past whose lives and teachings have given rise to religions which are an inspiration to their followers

statue of Buddha, upon whose teachings is based the religion followed by many people in Southern Asia and the Far East

Confucius, the Chinese philosopher, whose sayings form the basis of a way of life

Lao-tze, founder of Taoism, one of the chief religions of China

Zarathustra, founder of the religion of the Parsees of Persia and India

SOME OF THE WORLD'S GREATEST TEACHERS, EACH WITH A MESSAGE FOR MANKIND

by Flora Macdonald. He lived from 1720 to 1780.

3 : 224–225, *232*

His father, Prince James Francis Edward, "the Old Pretender," was the son of James II, and claimed the British throne. A rebellion in his support broke out in 1715, but was defeated. He lived from 1688 to 1766. See JACOBITES. (**3** : 223–224).

stubble, the short hard stalks of corn left in the ground after reaping. **1** : 346

style, a long, narrow, hollow stalk which rises from the OVARY to support the STIGMA. These form the female part of a FLOWER known as the PISTIL.

1 : 231

submarine, a warship which can move under the waves as well as on the surface of the sea.

4 : 206–208

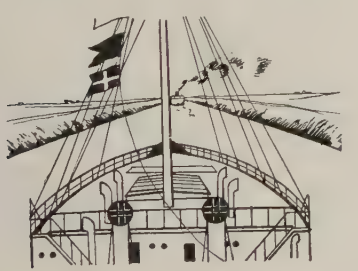
suction, see VACUUM.

Sudan, a country in north-east Africa that was formerly under joint British and Egyptian rule. The capital is Khartoum.

2 : 24–29, *155*

The Sudan is also the name of a vast region of desert, grassland and plain extending right across north-central Africa from the west coast to Ethopia (**2** : 24–29, *154*).

Suez Canal, a waterway 103 miles long in Egypt, between



Suez and Port Said, connecting the Red Sea with the Mediterranean. It is level all the way, and was opened in 1869.

2 : *37*, *155* ; **3** : *332*

Suffolk Punch, an English breed of work horse especially bred for farms, having a deep, heavy body and short legs.

1 : 360

suffragette, a woman supporter of the Votes-for-Women movement early in this century which aimed, by staging demonstrations and protests, to secure for women the same voting rights as men enjoyed. In 1918 after World War I older women were given the vote, and in 1928 women got the same voting rights as men. See also VOTE.

3 :126

sugar, a crystalline material used for sweetening food and drink, and obtained principally from sugar-cane but also from the sap of the maple tree and from SUGAR BEET.

1 : 327 ; **2** : 324–328, *331*, 339

sugar beet, a type of beet with a white root from which SUGAR is extracted.

1 : 335–336 ; **2** : 328

Sullivan, Sir Arthur, see OPERA.

sums, for younger readers may be concerned with adding numbers of things together, subtracting one number of things from another, multiplying things together, or dividing a large group into smaller groups.

6 : 107

sun, a burning star like many others in the universe, with a number of PLANETS circling round it, one of which is the earth. These planets are the satellites of the sun, and some of them like Earth and Jupiter have satellites or moons of their own. The sun looks bigger than the other stars only because we are near to it. It gives us just the right amount of heat to let life in its many forms develop. If we were nearer, it would burn us, and if we were farther away we should freeze. The sun and its planets make up the SOLAR SYSTEM.

2 : 17, 27, 358, *368*, 372–374

When men first became farmers they realized their dependence on the sun, and in some parts of the world they actually worshipped the sun. This sun-worship existed in ancient Peru and among the Aztecs of Mexico.

sundew, a small INSECT-EATING PLANT, generally found in peat bogs. Its leaves carry a number of sticky glands which trap any insect crawling over them, while the leaf curls over it, and finally digests the soft parts of the victim's body.

1 : 270–271

sundial, a means of telling the TIME from the sun. **4** : 377

sunlight, the LIGHT from the sun, which not only lights the world but enables plants to feed. See PHOTOSYNTHESIS.

4 : 322

sun-worship, see SUN.

surface tension, results from the attraction that the molecules of a liquid have for one another. The molecules on the surface are pulled downwards by the molecules underneath, making the liquid act as if it were in an elastic bag and creating a kind of "skin" to the surface.

4 : 63

swallow, a graceful bird with blue-black plumage and a long, forked tail. Its breast has a ruddy tinge. It is very swift in flight, and catches flying insects for food. It makes its nest of mud and grass on the beams in old buildings such as stables or barns. Swallows are summer visitors to Britain, and leave in the autumn for warmer lands. This is known as MIGRATION.

1 : 87–88, *95*, 300–302

swallow-tailed moth, a European moth in which each hind-wing is continued backwards in the form of a "tail." It flies at dusk, and seeks the darkness of woods. The caterpillars are known as "loopers" because of the way in which they move. **1** : 194, 299

swan, a large WATER BIRD with a long curved neck and arching wings, remarkable for its beauty. **1** : 101–103, *105*

swarm, see BEE.

sweat, perspiration, a fluid which appears on the skin, through the pores of the skin. In this way the body gets rid of some waste products, and regulates its TEMPERATURE.

1 : 365, 368

Sweden, the largest country of SCANDINAVIA in northern Europe, on the western shores of the Baltic Sea, rich in timber and mining resources. The capital is Stockholm.

2 : *152–153*

sweet vernal, a common plant in some woods and most meadows. When in meadows its flowers have purple ANTHERS, but when found in woods these

are yellow. It belongs to the group of GRASSES. **1** : 240

swift, an even better flier than the swallow, which it resembles. It is a larger bird, with powerful crescent-shaped wings, and a short, forked tail. It catches insects on the wing and seldom alights, except on its nest, or roost, and very occasionally to cling to a wall. **1** : 89–90

Swift, Jonathan, Dean of St. Patrick's Cathedral, Dublin, was the fiercest of humorists. His *Gulliver's Travels*, in which the hero at one time visits a land of very tiny people and captures

a fleet single-handed, and provides such wonderful adventure stories for children, is also, in its underlying meaning, a savage satire on the stupidity and wickedness of mankind. He lived from 1667 to 1745. **5** : 48 ; **3** : 239

swimming, the sport of propelling oneself through the water. It should be learned by every healthy person both as a pleasure and a means of preserving life. Among the strokes which you can learn are the "dog paddle," the breast stroke, the crawl and the back crawl. See also DIVING. **6** : 291–295, *299*

Switzerland, a small republic between France and Austria in the heart of Europe. Switzerland has no sea-coast. The Swiss are famous watch-makers, and their lovely mountain scenery and winter sports attract many tourists. In the

mountains, the Swiss herdsmen still blow down a very long wooden horn called an *alpenhorn*. In this way they can signal across many miles. The capital of Switzerland is Berne. **2** : *152–153*, 216–220, *223*

swordfish, a large fish with a sword-like snout. **1** : 169

Sydney, the largest city in Australia, has one of the finest harbours in the world. Its population is 2 million. **2** : *161*

symphonic poem, a piece of orchestral music suggested by a story, seeking to reproduce that story in terms of music. Such a piece is *The Sorcerer's Apprentice* by Dukas. **5** : 257

symphony, the form of musical composition for orchestra in which many of the great composers have done much of their finest work. HAYDN, MOZART, BEETHOVEN, BRAHMS, SCHUBERT, TCHAIKOWSKY and SIBELIUS have all written great symphonies. Normally the symphony consists of 4 contrasted but closely related movements. **5** : 238–241

syringe, an instrument consisting of a piston or stopper sliding inside a metal cylinder. When you put the end of the cylinder in liquid and pull up the piston the liquid fills the cylinder, and when you push down the piston the liquid is forced out with a rush.

A garden spray is one kind of syringe. **4** : 69–70

T

table tennis, an indoor game played by 2 or 4 players on a large oblong table with small, roundish bats (usually of plywood) and light celluloid balls. The net is 6 inches high. **6** : 295–298

tadpole, the young of the FROG, that begins life in the water and goes through a change of form known as METAMORPHOSIS before it is ready to live on land. See also TOAD, NEWT **1** : 15, 144, *146–147*, 149–152

tailed moth of Madagascar, one of the world's most beautiful insects. It is one of the moths that fly in the daytime, and its brilliant colours rival those of the most dazzling butterflies. **1** : *188*, 195

Tamerlane, see MONGOLIA.

Tanganyika, a country of East Africa. It contains Mount Kilimanjaro (over 19,000 feet), the highest mountain in Africa. The products, mainly agricultural, include sisal and hemp. **2** : *154–155*

tanker, a vessel specially built for carrying oil. **4** : 103, 196, *197*

tannery, a factory for cleaning and tanning hides and so making LEATHER. **4** : 319–321

tap, the device by which we turn on or shut off at will a flow of water from our house water-supply. See WATER SYSTEM. **4** : 76

tape grass, see VALLISNERIA.

tape-recorder, an instrument which records sounds by magnetizing a strip of steel tape and plays them back so that people can hear the original sounds. It can record up to 3 hours on one reel. **4** : 375

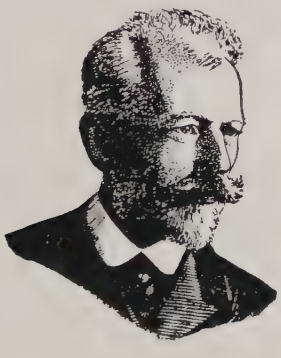
tap-root, the main root of a plant, usually succeeded by small side roots. It anchors the plant firmly and collects water from the soil. The tap-root continues to grow straight downward and in some plants serves as a food-storage organ, as in the turnip, or carrot. **1** : 230, *233*

Tasmanian devil, a black pouched MAMMAL about the size of a cat. It used to be found in many parts of Australia, but now lives only in Tasmania. In the wild, it is extremely fierce and will attack other

animals with great ferocity, but it is easily tamed. 1 : 66

taxes, amounts of money raised from the people to pay for the army, navy, air force, schools, police, and all the services necessary for the efficient working of a modern country. Nowadays the principal tax is upon the income or earnings of people. The amount given to the tax-collector rises steeply the richer one is, and it is collected either weekly as one earns it or in a lump sum once a year. Other taxes are on certain goods, so that part of the price you pay goes to the state. 3 : 122–123

Tchaikowsky, Peter Ilyich, a great Russian composer whose



work—symphonies, concertos, operas and ballets—has been loved not only in Russia, but throughout the world. The purely Russian element in his music has been modified by the influence of Italian music, and this perhaps made his music easier for western Europeans. It has served as a bridge to Russian folk-music and more nationalistic composers. He lived from 1840 to 1893.

5 : 238–239, 265, 268, 272

tea, a drink much esteemed in Britain, China and elsewhere. It is made by soaking the leaves of the tea plant in boiling water. Tea-planting is carried on in a tropical climate in India, China and Ceylon. The young leaves are dried, fermented and blended before being ready for use. 1 : 327 ; 2 : *296*, 297–302

telegram, a message, usually short, sent by TELEGRAPH.

4 : 173–174

telegraph, the instrument by means of which the post-office sends telegrams.

4 : *170*, 171–175

The message travels as a series of electrical impulses along telegraph wires by the roadside or in wire cables under the sea, and reaches its destination in an hour or two, whereas a letter would have required days. More recently we have learned to send pictures by telegraph ; this is called photo-telegraphy. See also MORSE.

4 : 174–176

telegraph ship, see CABLE-LAYING SHIP.

telephone, an instrument by which one can speak with someone at a distance. The voice of the speaker sets up electrical impulses which travel from the mouthpiece along a wire and make sounds in a distant earpiece. 4 : 176–178

teleprinter, an instrument with a keyboard, on which a telegram is typed. This causes electrical impulses to travel along a wire to a distant teleprinter, where the letters of the message are printed, ready to be delivered. 4 : *170*, 174

telescope, an instrument using lenses through which we see distant objects as though they were much closer.

4 : *330*, 331 ; 2 : 355

television, the sending through space of pictures of happenings that are going on elsewhere, and their reception on receiving screens in people's homes. It is a form of broadcasting, and is normally accompanied by the radio transmission of sounds. Thus we can both see and hear a play that is televised. A special camera is needed, different from the film camera.

4 : 176, 355–357

Telford, Thomas, Scottish engineer, who was responsible for building many fine roads, bridges and canals, including the Menai Suspension Bridge between Caernarvonshire and the Isle of Anglesey and the Caledonian Canal across Scotland. He lived from 1757 to 1834. 3 : 250

Tell, William, hero of the Swiss people in their struggle for freedom against Austrian rule in the 15th century. He is

said to have shot an apple off his son's head. 2 : 218

Telstar, an artificial satellite put into orbit round the earth by the Americans. It can relay radio messages, T.V. programmes, etc. across the Atlantic.

4 : 355

temperature, the degree of heat in a substance, usually measured by means of a THERMOMETER. 4 : 42

The human body when well has a temperature of 98·4 deg. Fahrenheit (1 : 371).

tendon, a cord of tough white fibre connecting a MUSCLE to a bone. 1 : 373–374

tennis, see LAWN TENNIS.

Tennyson, Alfred, Lord, an English poet highly esteemed

by the Victorians, whose lyrics in *In Memoriam* express the values, doubts and hopes of his age. He retold the stories about King ARTHUR and his knights in a long narrative poem called *The Idylls of the King*. He lived from 1809 to 1892.

5 : 34–35, *37*, 99–100, 102

Ter Borch, Gerard, a Dutch painter who lived from 1617 to 1681. 5 : 134

termite, the "white ant" of the tropics. It is not a true ant but related to the grasshopper, cockroach and cricket. It lives in giant termite hills, built of earth and cemented with SALIVA. 1 : 214, 217

terrapin, see TORTOISE.

theatre, a form of entertainment dating from ancient times. Ancient Greek theatres consisted of tier upon tier of unroofed seats in a great three-quarter circle sweep looking down upon a flat round area in which the actors moved and spoke. Roman theatres followed this pattern but were half-moon in shape ; and the area behind the actors was squared off with a wall like that of a palace or other fine building suitable for many settings. The actors, too, were raised from ground level by means of a stage. See GREEK DRAMA and ROMAN DRAMA.

5 : 76–90

In England DRAMA developed from the churchyard by way of the wheeled pageant (**5** : *74*). The first theatres were built in the reign of Queen Elizabeth I, the Globe (**5** : *83*) being an early one. For later developments compare the Italian and English theatres (**5** : *86*).

thermometer, an instrument for measuring how hot something is. There are two main kinds with different scales of measurement. On the Centigrade scale the freezing point of water is shown as 0 degrees and on the Fahrenheit scale it is 32 degrees, so you must mention the name of the thermometer when giving a measurement.

4 : 41–42

theromorph, means "beast-shaped." It is a name given to certain REPTILES which lived long ago. **1** : 279

thigh, that part of the leg between the knee and the trunk of the body. **1** : 372–373, 375

thistle, one of a number of prickly plants with purplish

or yellowish flowers and pointed leaves. It is the national emblem of Scotland. **1** : 356 ; **3** : 27

Thor, in Norse mythology is the god of thunder who defends mankind against the powers of evil. **5** : 14

thorax, in the higher animals, the upper part of the body, between the neck and the ABDOMEN, which contains the ribs, heart and lungs. In insects, the thorax is the middle part, between the head and the adomen. **1** : 189, 200

thought reading, a form of amusing deception often practised in conjuring. One's thoughts are not really read, but simply seem to be so. **5** : 380

three-dimensional picture, gives an illusion of depth similar to what we see around us when we use our eyes, and is therefore more realistic than the normal picture which has length and breadth but no depth.

4 : 334–335

threshing, beating corn so as to separate the grain from the chaff and straw. **1** : 335, 346–347

thrush, a bird of the fields and woods, well known for its song. The song-thrush lays four or five eggs, usually bright turquoise in colour, with black spots. The eggs of the mistle-thrush are white, with reddish-brown spots. **1** : *95*

Tibet, a country in Asia north of the HIMALAYAS. Most of the people are nomads tending their flocks. The yak, a sort of ox, is the chief beast of burden. The capital is Lhasa, long known as the "Forbidden City." **2** : *158–159*, 238–243

tides, the twice-daily rise and fall of the sea caused by the gravitational pull of the moon and the sun. The tides are highest when sun and moon are pulling in a straight line, lowest when sun and moon are pulling at right-angles to each other. **2** : 362

Tierra del Fuego, a large group of islands at the southern tip of South America. They belong partly to Argentina and partly to Chile. The name is Spanish for Land of Fire.

1 : 309

tiger, the largest and most powerful of the CAT family. It has a yellow coat with black stripes that blend well with the tall jungle grass and undergrowth in which it lives. It is

found in many parts of Asia, killing deer and wild pigs for its food. **1** : *32*, 33–34

tiger barb, a fish belonging to the carp family. Barbs are found in great numbers in the warm seas of Asia and Africa, and in Europe and North America. They are in demand for home aquariums.

1 : *176*, 177

tiger beetle, see BEETLE.

tiger snake, one of the most deadly of the snakes found in Australia. It may be anything from 2 feet 6 inches to 6 feet long. **1** : *135*

timber, a general term applied to wood before it has been made into anything. It is described as hardwood or softwood, according to the kind of tree from which it comes. Timber is valuable in many kinds of industry, such as furniture-making and building. See also CHARCOAL.

4 : 248–252 ; **2** : 46–48, 51–53

time, the past, present and future. To mark the passage of time through the course of the day was necessary even for the men of ancient civilizations and is even more necessary today. **4** : 376–383

Man has invented various devices to tell the time—the position of the shadow cast by a post (**4** : 376), the Egyptian water-clock and the sundial (**4** : 377), and the nocturnal which told the time by starlight (**4** : 378). There was also the hourglass (**4** : 379) from which comes the modern egg-timer, and the marked candle (**4** : 379). Clocks, when invented, were themselves of many kinds (**4** : 379–383), from grandfather clocks to watches (**4** : 381–383), and from astronomical clocks to the modern electric clock (**4** : 383). Telling the time, for young children, is also described (**6** : 105).

timothy grass, also called cat's-tail, a well-known decorative grass. Its flowers, which appear from June to September, are carried in a crowded purplish spike. **1** : 240

timpani, see DRUM.

tinplate, sheet iron coated with a film of tin to stop it rusting. **2** : 284 ; **4** : 259

tit, a family of perky, plump little birds, found all over Europe and in parts of Asia and

Africa. The chickadees of North America are also tits. The blue tit is often seen in gardens. **1** : *78*, 80–81

toad, one of the group of AMPHIBIANS. Its life-history is similar to that of the FROG. **1** : *145–147*, 149–151

toadstool, see FUNGUS.

tobogganing, the sport of descending a slope of beaten snow or ice on a toboggan or sledge. In Switzerland and Canada special toboggan runs are made. **6** : *282*, 298

Tokyo, the capital of Japan. The population is over 6 million. **2** : *158*, 253

tollgate, a stopping place at which charges could be levied on coaches, etc., using the highway. **3** : 249

Tomlinson, Henry Major, a British novelist who draws largely on his own experience of the sea and the Far East for his subjects. He was born in 1873. **5** : 67–68

"Tom Sawyer," see TWAIN.

tools, devices for making work easier and more productive. The crowbar, the WEDGE, the PULLEY, are tools of very wide use, while every trade and craft has its own tools for special purposes. **4** : 14–17, 22–27

tooth, a part of the mouth consisting of an inner pulp with blood-vessels and nerves and a thick outer layer of ivory, coated with hard enamel. A human being has 32 teeth. **1** : 364

Flesh-eating animals have sharp cheek-teeth that can slice or shear their food, incisors, for gripping and holding, and canines, mainly for defence and used in a slashing cut. The teeth of grass-eating animals are flattened for grinding. In RODENTS, the front teeth continue to grow throughout life.

torpedo fish, one of the electric RAYS, is a flat, oval sea fish capable of giving a dangerous electric shock. **1** : 168

tortoise, a REPTILE protected by a hard shell into which head and legs can be withdrawn at a sign of danger. It has an internal skeleton of which the shell is a kind of extension formed of thick bony plates on the inside and thin horny plates outside. Tortoises and turtles (which are simply sea tortoises) have no teeth but a sort of beak. Some eat vegetables, some meat. The word terrapin is of North American Indian origin ; it is applied to freshwater tortoises, and is used almost exclusively for the North American species. Green turtle is the kind used for turtle soup. **1** : 15, 137–142, 278

Toscanini, Arturo, an Italian musician, perhaps the most famous CONDUCTOR of our century. He lived from 1867 to 1957. **5** : 238

toucan, a brilliantly coloured bird of South America, with a huge bill that gives it a top-heavy look. The bill, however, is of very light structure and is used for picking soft fruits very daintily. **1** : *117*, 120–121

tournament, a friendly fight between armoured knights on horseback before spectators. **3** : 106, 108

Tower of Babel, see LANGUAGE.

Tower of London, the castle built in London in the reign of William the Conqueror. Later it was enlarged, and made more comfortable, so as to serve as a royal palace for many English sovereigns until Stuart times. It was also used as a prison for state prisoners. Among those imprisoned here—many of whom were executed—were Queen Anne Boleyn, Sir Thomas MORE, Sir Walter RALEIGH, and Guy FAWKES. **3** : 77

The Crowns and CROWN JEWELS of the British monarchs are kept at the Tower.

town, a large collection of houses, with public buildings such as a town hall, churches, theatres, restaurants, and so on. **6** : 67–69

Townshend, Lord, an agricultural reformer of the 18th century who encouraged the planting of turnips and the rotation of corn with root crops and grass. He lived from 1674 to 1738. **3** : 260–261

toys, the objects with which children play. Many are models of things used by adults. **6** : 88–89

toy theatre, a most attractive hobby involving several crafts. You have to build the theatre; you have to draw, paint and cut out the characters and mount them on slides ; make and paint the scenery ; write the plays, giving your characters things to say and do ; and finally put on the shows, moving the characters and speaking their parts as if with their voices. **5** : *286*, 362–366

trachodon, one of the duck-billed DINOSAURS that lived at the same time as the tyrannosaurus, during the great Age of REPTILES. It spent much of its time in the water, feeding on water-plants. On land, it could move about on all four feet, or it could walk upright on its hind legs. **1** : *283*

tractor, a vehicle driven by a motor engine, used for draw-

ing a plough or other device. **1** : 333–334, *341–342*, *344*, 346, 348–349, 351, 356 ; **4** : *133*

trade, the process of exchanging goods by means of buying and selling. The great lifeline of trade throughout the world is shipping. **2**: 226, 269, *277*, 352

trade unions, associations of wage-earners in each occupation, such as railwaymen or miners or lorry-drivers, with the aim of improving their wages and conditions of employment. **3** : 100–101

Trade Winds, the name given to the prevailing winds that blow across the oceans of the world. In the days of sailing ships the main shipping routes followed the course of such winds. **2** : 114

traffic lights, modern system of electric lights to regulate the flow of traffic at cross-roads, etc., especially in towns and cities. **4** : 189

train, a form of transport. **4** : 214–230, *220–221*

A locomotive or railway engine (**4** : 218–233) pulls a number of coaches, vans, trucks or wagons (**4** : 215) along a track consisting of two specially fixed steel lines. Railway trains are a fast and convenient way of carrying people or goods. They require a vast organization of railroads including special stations (**4** : 215–217) at which passengers can alight or goods be put on.

The safety of every train depends on a system of signals which tell the engine-driver when it is safe to proceed or when he must stop (**4** : 224–225).

Many railway engines are still steam-driven (**4** : *219–222*), but DIESEL engines are common in some countries and in others the trains are driven by electricity. In Britain one finds all three kinds. There are also many special types of train like the London Underground Railway (**4** : 227–228), or the Swiss funicular railways on which coaches are pulled up the sides of mountains (**4** : 228), or the suspension railways in which cars are suspended from long cables slung from a mountain top to some spot in the valley (**4** : 228).

train ferry, a ship capable of carrying passenger coaches across a waterway. **4** : *197*

tram-car, a city VEHICLE running on rails and driven by electricity. See also TROLLEY-BUS. **4** : 186, *187*

tramp steamer, a vessel which carries cargo from port to port on the oceans of the world. **4** : 201

transformer, a device for raising or lowering the voltage of an electric current. **4** : 154

transpiration, the loss of water from a plant through the leaves. This loss is made good by water taken in from the soil through the roots. This steady flow through the plant thus maintains a constant supply of cooling water and mineral salts. **1** : 228–229

transport, the general name given to the moving of goods by road, rail, sea or air. **2** : 269–273, *277* ; **4** : *169*, 184–247

The coloured pictures dealing with transport show mail trains (**4** : *169*), vehicles for carrying people (**4** : *187*), for carrying goods (**4** : *188*), ships (**4** : *197–200*, *209*), railways (**4** : *219–222*) and aeroplanes (**4** : *231–232*, *241–243*).

travelling, the method of going from place to place, whether on foot, by road, train, ship or aeroplane. **6** : 70–72

trawling, catching fish that live in the depths of the sea by means of a huge dragnet (shaped like a giant butterfly net) hauled along the sea-bed by a special ship called a trawler. **1** : 184

tree, a large PERENNIAL plant that has a single main stem, or trunk, with many branches spreading from it. The trunk is protected by a covering of bark, which varies in colour and thickness and in pattern, according to the kind of tree. The wood, or TIMBER, has many uses. See also LEAF, PLANT, SEED. **1** : 251–259 ; *255–256* ; **2** : 45–48, 52 ; **6** : 75–76

New trees grow from seeds. Some bear flowers and some, such as the pine, fir and spruce, bear cones containing the seeds from which the new plant will grow. They are called coniferous trees. Most conifers belong to the group of evergreen trees, which shed the old leaves only after new leaves have formed, and therefore have leaves at all seasons of the year. (**1** : *256*, 257–259 ; **2** : 50).

The larch is the only coniferous tree in Britain that is not

an evergreen. It sheds its leaves in the autumn, like the oak, beech, elm and horse-chestnut. Such trees are called deciduous. (**1** : 254, *255*).

The bark of each kind of tree has a distinctive pattern. These can be copied by making bark-rubbings. (**1** : 252 ; **5** : 304–305).

tree-creeper, one of the group of perching birds. It spends its time climbing tree-trunks, clinging with its feet and using its tail to help it keep its balance. With its long, slender beak it prises out insects that live in cracks in the bark. **1** : 99

trial, a legal process in which a suspected law-breaker is brought before a magistrate, or judge and jury, and witnesses are called upon to give evidence, that is, to answer questions connected with the supposed crime. A barrister will act for the Crown, as it is called, questioning the witnesses to try to expose the guilt of the one who is being tried, while another barrister will question the witnesses to try to show that the prisoner is innocent. In British law-courts the prisoner must be assumed to be innocent until he is proved guilty. **3** : 375

trial by combat, the testing of guilt or innocence by a duel

between accused and accuser. This is a medieval idea which has little connexion with justice. 3 : 285

trial by ordeal, a medieval test as to whether a person was guilty of a crime. The accused had to undergo a test such as picking a stone out of boiling water. 3 : 284, 286

triangle, in music, a percussion instrument of the ORCHESTRA, made simply of a metal rod bent to form an open triangle. When struck it gives a sharp ping or ting-a-ling sound. 5 : 226

In geometry, the triangle is a flat, three-sided figure, the sides of which meet to form three angles. Triangles can be of many shapes and sizes, but the length of any two sides is always greater than the third, and the three angles when added together always form two right-angles.

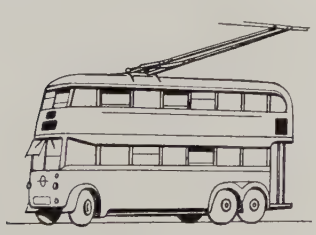
triceratops, a horned DINOSAUR that lived millions of years ago during the great Age of REPTILES. It carried three horns, two on top of its head and one on the snout, and a massive frill on its neck, which were a good protection against its enemies. 1 : *282*

triforium, the gallery below the CLERESTORY and above the pillars or arches of the NAVE of a church or cathedral. 5 : 198

trio, see CHAMBER MUSIC.

Trojans, a people of the ANCIENT WORLD, whose great city, Troy or Ilium, was destroyed by the Greeks about 1,200 B.C. The legendary story of the great Trojan war is told in Homer's *Iliad.* 5 : 11–12

trolley bus, a bus having an electric motor instead of a



petrol or diesel engine and getting its electricity supply from overhead wires like a TRAM-CAR. It does not run on rails, however. 4 : 186

trombone, a tubular brass wind instrument of the ORCHESTRA producing tenor notes, and having part of its tube sliding in and out, whereby different notes are produced. 5 : 226

Tromp, Admiral Martin van, led the Dutch fleet that was defeated by the English under BLAKE and himself later defeated Blake. Later still in a three-days' battle the Dutch were driven back to the coast of France. He lived from 1597 to 1653. 3 : 215–217

tropical fish, found in great numbers in warm seas or rivers. Most of them are brilliantly coloured and many kinds can be kept in a home AQUARIUM, such as the GOURAMI, GUPPY, NEON TETRA, TIGER BARB and ZEBRA FISH. 1 : 173–178, *176*

tropics, the hot zone along the EQUATOR within the Tropics of Cancer and Capricorn. 2 : 15–24

trumpet, a tubular brass wind instrument of the ORCHESTRA, producing treble notes when blown. To get different notes you open and close valves with the fingertips. 5 : 226

trunk, the name given to the body of a man or animal, not including the head, arms and legs. 1 : 373

The woody main stem of a tree is also known as the trunk (1 : 251–253 ; 2 : 52).

tuatara, a descendant of a group of REPTILES that lived millions of years ago, and differing in many ways from all other reptiles of today. About two feet long, it makes its home in a burrow, and hunts for food at night. It is found only on some islands north of the South Island of New Zealand. 1 : 140, 142, 278–279

tuba, a large tubular brass instrument of the ORCHESTRA. 5 : 226

tuber, a short fleshy underground stem or shoot, such as the POTATO. 1 : 231

Tudor rose, the emblem of the Tudor Kings, formed from the white rose of York and the red rose of Lancaster. See Wars of the ROSES. 3 : 50, *151*

tug-boat, a small vessel with a very powerful engine. Its sole purpose is to pull or push other boats. 4 : 194–231, *233*

tulip, a plant that grows from a BULB, and produces a large cup-shaped flower in the spring. 1 : 231, *233*

tulip tree, a tree from North America. It often reaches a height of a hundred feet, and bears tulip-like flowers, usually white. It is related to the magnolia. 1 : 250

Tull, Jethro, an agricultural reformer of the 18th century who developed a horse-drawn drill for sowing seeds. He lived from 1674 to 1741. 3 : 261

tumboa, a plant of the South-west Africa desert, with ribbon-shaped leaves. It is often called *Welwitschia,* after its discoverer, Welwitsch. Its trunk grows 6 feet across and only 1 foot high. 1 : 268

tundra, the cold treeless regions of northern Europe, Asia and North America, mainly in the vicinity of the Arctic Circle. 2 : 57

tuning-fork, a two-pronged steel instrument which emits, when struck, a note of accurate pitch to serve as guide to singers and musicians. 4 : 370

tunnel, a hole bored right through a hill or under a riverbed to let a road or railway go through to the other side. 4 : 191–192

Turkey, a country, mainly in western Asia, with a small area in south-east Europe. Agriculture is the main industry but there are large mineral resources. The chief towns are ISTANBUL (formerly Constantinople), and Ankara, the capital. 2 : *158–159*

Turner, Joseph Mallord William, English painter who painted storms at sea and gorgeous sunsets, delighting the eye with new visions of natural phenomena. He lived from 1775 to 1851. 5 : 142, 144–145

turnip, a garden plant cultivated for its thick root, which is cooked and eaten. 1 : 230, 351, 355

turtle, see TORTOISE.

Tutankhamen, see PHARAOH.

Twain, Mark, an American writer famous for his stories *Tom Sawyer* and *Huckleberry Finn*, novels cherished by boys throughout the English-speaking world. He lived from 1835 to 1910. **5** : 54, *55*

Tyler, Wat, leader of the 14th-century PEASANTS' REVOLT. He was killed while addressing the young King Richard II at Smithfield in 1381. **3** : 138–140

Tyndale, William, early translator of the New Testament and Protestant martyr. He lived from 1490 to 1536.
3 : 204 ; **5** : 42–43

Tyne, a river in north-east England flowing into the NORTH SEA. It is an important shipbuilding centre. **2** : *148*, 290

type, the small pieces of metal, each bearing the form of a letter, used in PRINTING.
4 : 295–296

tyrannosaurus, the largest of the flesh-eating DINOSAURS.
1 : 280, *283*

U

Uccello, Paolo, an Italian painter who lived from 1397 to 1475. He was one of the early painters to use PERSPECTIVE.
5 : *124–125*

Uganda, a member of the British Commonwealth in East Africa, between the Congo and Kenya. The chief towns are Entebbe, the administrative capital, and Kampala.
2 : *154–155*

Ulysses, a warrior-hero and wanderer of Greek legend. His adventures after the siege of Troy form the story of HOMER'S epic, the *Odyssey*. **5** : 12–13

"Uncle Remus," see HARRIS.

"Uncle Tom's Cabin," see STOWE.

under-water exploration, a sport in which the swimmer is equipped with goggles, mask and a compressed air cylinder which enables him to breathe under water.
1 : *158*, 159–161 ; **4** : 365

U.N.E.S.C.O., the abbreviation for the United Nations Educational, Scientific and Cultural Organization, a branch of the UNITED NATIONS ORGANIZATION. **3** : 359

U.N.I.C.E.F., the abbreviation for the United Nations International Children's Emergency Fund, a branch of the UNITED NATIONS ORGANIZATION.
3 : 359

Union Jack, the national flag of the UNITED KINGDOM of Great Britain and Northern Ireland. When James VI of Scotland became James I of England, the red cross of St. George was joined to the white diagonal cross of St. Andrew. In 1801, when Ireland became part of the United Kingdom, the red diagonal cross of St. Patrick was added, giving us the flag we know today. **3** : 262–263

Union of the Crowns, see JAMES I.

United Arab Republic, see EGYPT.

United Kingdom consists of GREAT BRITAIN and Northern Ireland. The kingdom has the Queen at its head and is governed by Parliament. Northern Ireland has another parliament of its own for matters affecting only itself. **2** : *147*

United Nations Organization, the body set up after the Second World War to discuss world problems and try to find peaceful solutions to disputes between nations. Its headquarters is in New York and it has various international bodies, such as UNESCO, UNICEF and WHO. **3** : 358–360

United States of America, a country which, with Canada, occupies the greater part of NORTH AMERICA. It consists of 50 states, including Alaska and Hawaii. It possesses a greater variety of agricultural, mineral, and industrial resources than any other country in the world. The capital is Washington. Other cities are NEW YORK, Chicago, Philadelphia, Los Angeles and Detroit.
2 : *162–163*, 185–196

The United States of America consisted originally of a group of 13 colonies of the British Empire, among them Pennsylvania, founded by William Penn, the Quaker. They broke away in 1776 to form an independent nation. In their war of independence, their general and leader, George Washington, was assisted by French troops under the command of the Marquis de Lafayette, a nobleman who later took a leading part in the French Revolution. Washington later became the first President of the United States. From 1861 to 1865, the Northern States fought the Southern States over the question of slavery. Abraham Lincoln, the President and

leader of the Northerners, won and kept the states united, but he was assassinated soon after his victory. The U.S.A. fought beside Great Britain in both World Wars, and has played a leading part in the organization of the UNITED NATIONS. (**3** : 258–259, 345, 351, 355–360).

univalve, the name given to a MOLLUSC, such as the limpet, that has a single shell.
1 : 17–18, 155–156

universe, the great mass of STARS, PLANETS, MOONS and COMETS, of which our earth forms part. **2** : 355, 382–383

Uruguay, a country of SOUTH AMERICA. Cattle and sheep-rearing are important industries. Montevideo is the capital and chief port. **2** : *165*, 177

U.S.S.R., see RUSSIA.

V

vacuum, a sealed space from which the air has been extracted. Make a hole in the container and the air pressing outside will rush in. **4** : 54

A partial vacuum (**4** : 363) occurs when some air within a container is removed, making the air pressure outside greater than the air pressure within.

vacuum cleaner, a floor or furniture cleaner which withdraws dust into its interior by an electric FAN. **4** : 156, 364

vacuum flask, consists of an inner and outer chamber with the air removed from between them, thus forming a VACUUM. Neither heat nor cold can pass through a vacuum ; so, in the inner chamber of the vacuum flask, tea can be kept hot or ice-cream cold. **4** : 54–55

Valhalla, the warrior's heaven in Norse and German legend. **5** : 14–15

Valkyries, in Norse MYTHS, the supernatural warrior-women who rode through the air and accompanied to VALHALLA those who died in battle. WAGNER introduces them into his cycle of operas based on German legends. **5** : 14–15

valley, the low-lying land through which flows a stream or river. The rivers and their tributaries actually make most valleys, but some have been made by glaciers. **2** : 65–69

vallisneria, or tape-grass, a water plant, useful in the home aquarium. **1** : 177, 239

Vancouver, third largest city of Canada and the chief port for western Canada. It is also the terminus for the Canadian Pacific and Canadian National Railways. **2** : 162

Van Dyck, Sir Anthony, a Flemish painter who came to England, becoming Court-painter to Charles I. He lived from 1599 to 1641. **5** : *136*

Vaughan Williams, Ralph, a British composer of originality and power. He wrote seven SYMPHONIES and five OPERAS including *Hugh the Drover* and *Pilgrim's Progress,* and is a great figure in the music of our century. He lived from 1872 to 1958. **5** : 250–251, 260

vegetables, plants which we grow to eat, like cabbages, of which we eat the leaves; carrots, of which we eat the root; peas, of which we eat the seeds. See also CROPS. **6** : *59*

vehicle, any type of machine for carrying people or goods from place to place by road. A bicycle, a taxi, a farm cart, a motor-coach are all vehicles. **4** : 184–189, *187–188*

vein, one of the three kinds of blood-vessels in the body. It carries the blood back to the heart after it has been distributed to all parts of the body by the ARTERIES and CAPILLARIES. (See also CIRCULATION.) **1** : 228, 369, 371

In a plant, the branching, threadlike lines on the leaves are called veins (**1** : 228).

veldt, a name of Dutch origin given to the GRASSLANDS of South Africa. **2** : 42, 232

Venezuela, a country in the north of South America between Colombia and British Guiana. The chief products are oil, coffee, cocoa, sugar and cotton ; the capital, Caracas ; the chief river, the Orinoco. **2** : *164–165*

Venice, a city in Italy built on nearly one hundred small islands in a lagoon. They are separated by canals, which serve

instead of streets. During the early part of the Middle Ages Venice was a great port for trade between Europe and the East, but its importance declined after the discovery of America. **5** : 133, 292 ; **2** : *153*

Venus, see SOLAR SYSTEM.

Venus, in Roman mythology the goddess of love. **5** : 11

Venus's fly-trap, one of the INSECT-EATING PLANTS. The leaves are divided into two halves, facing each other and hinged at the bottom. Once an insect touches the hairs on the leaf twice in succession the two halves fold over and trap the insect. It eventually dies and is digested by the plant. **1** : 270–271

verbs, the words which express actions : *jump, swim, walk, ride, whistle* ; even *think, keep, sleep* are all "doing words". **6** : 147–151

Verdi, Giuseppe, the most famous Italian composer of OPERA. Among his works were *Aïda, Rigoletto* and *Il Trovatore.* He lived from 1813 to 1901. **5** : 228, 242, 244–245

Vermeer, Jan Van Delft, a Dutch artist famous for his pictures of indoor life and also for his landscapes. He lived from 1632 to 1675. **5** : 140

Verne, Jules, a French author who wrote many exciting scientific adventure stories more than half a century ago. He sent his characters to the moon in *From Earth to Moon,* and under the sea in *20,000 Leagues Under the Sea.* He lived from 1828 to 1905. **5** : 71–72

vertebrates, animals with backbones. This large group is made up of five smaller groups, FISH, AMPHIBIANS, REPTILES, BIRDS and MAMMALS. **1** : 13–16, 276–277, 278–285

Victoria, the Queen of Great Britain during a period of great national expansion and prosperity. She reigned from 1837 to 1901. **3** : *2*, 342

Victoria Falls, the waterfalls on the ZAMBESI River in Africa. They were discovered by David Livingstone. **2** : 101, *162* ; **3** : 322–323

Vienna, a city on the DANUBE and the capital of Austria. The population is 2 million. **2** : *152*

Vikings, the name given to the Northmen from Norway and Denmark who raided the coasts of Europe during the 9th and 10th centuries. It is believed that they even sailed to North America. Many of them settled in the eastern parts of England. **3** : 52–60, *58*

Vinci, Leonardo da, Italian painter, also outstanding as a sculptor, inventor, naturalist, engineer and architect. His portrait of the *Mona Lisa* is one of the great art treasures of the Louvre, Paris. He lived from 1452 to 1519. **5** : 127–130

vineyard, a plantation of grape-vines for wine-making, common in France, Spain, Italy, Germany, South Africa and Australia. **2** : 202–203, 214, 217

viola, an instrument like the VIOLIN but slightly bigger and tenor in scale. It is seldom used as a solo instrument, but figures in the ORCHESTRA and in CHAMBER MUSIC. **5** : 226

violin, a musical instrument dating from the 16th century and consisting of four strings stretched taut over a flattish hollow body shaped like a rough figure eight. It is used as a solo instrument, or massed in the ORCHESTRA.

The most famous maker of violins is Antonio Stradivarius, who lived from 1644 to 1737. **5** : 225

violoncello, see CELLO.

Virgil, see ROMANS.

vitamins, chemical substances found in certain foods in their natural state. These are necessary for life and health in human beings and animals. Fresh fruit, oil, egg yolk, and milk are all rich in vitamins. **1** : 364

volcano, a mountain created by the eruption of molten rock which, under pressure and at a great temperature, breaks through the crust of the earth from time to time. Some well-known ones are Vesuvius, Etna and Stromboli in Italy, Fujiyama in Japan, and Cotopaxi in South America. **2** : 87, *91*

vole, a small gnawing animal belonging to the group of RODENTS. The short-tailed field-mouse, or field vole, does much damage to crops, but the water vole, known also as the water-rat, is harmless. The MUSKRAT is the biggest of the voles. It is found in North America and is much prized for its fur. **1** : 37, 39, 310

Volga, a river that flows 2,000 miles through Russia to the Black Sea. **2** : 246

Volta, Alessandro, Count, an Italian scientist who was the first to make an electric BATTERY. He lived from 1745 to 1827. **4** : 145–146

volume, the amount of space that anything takes up. First make sure that you understand AREA, which concerns the length and breadth of flat surfaces like the floor of your room. Then consider, not the floor, but the space which your room contains—the space between the floor and the ceiling. That introduces height of the walls as well as the length and breadth of the room. You will find that all volumes are measured in terms of what is called cubic capacity, length, breadth and height being multiplied together to get a cubic result. **6** : 135–137

vorticella, or bell-animal, a tiny creature found in stagnant water. Its body consists of a bell-shaped head, with a crown of protoplasmic hairs around the wider end, supported on a long stalk. **1** : 226

Vortigern, a British chieftain who persuaded the Jutes (see ANGLO-SAXONS) to help him fight the Picts. **3** : 33

vote, the right of every man and woman of 21 and over in Britain to help to elect the members of the House of Commons by choosing one of the candidates for election in his or her district or CONSTITUENCY. The votes for each candidate are counted and those that receive most votes in each district are elected. This is called election by ballot. See PARLIAMENTARY ELECTION. **3** : 125–126

vulcanizing, see RUBBER.

Vulgate, the Latin version of the Bible made by St. Jerome and accepted as authoritative by the Roman Catholic Church. **5** : 41

vulture, a BIRD OF PREY related to the eagles and hawks. **1** : 116, 120, 122–123

W

Wagner, Wilhelm Richard, a German composer and perhaps the world's most famous composer of operas. He based his operas on German mythology, writing the words as well as the music. Above all other composers he sought to make a complete harmony between the music and the dramatic story. Among his works are *The Valkyries*, *Siegfried*, *The Twilight of the Gods*, *Tristan and Isolde* and *The Mastersingers*. He lived from 1813 to 1883. **5** : 15, 36, 228, 244–246, *247*

Waitangi Treaty, a treaty made between Britain and the MAORIS which ended the fighting between them in New Zealand. **3** : 317

Wakefield, Edward Gibbon, a pioneer in the development of Australia and New Zealand. During imprisonment for a youthful folly his thoughts turned to the development of the colonies, to which he devoted vast energy and enthusiasm for the remainder of his life. He lived from 1796 to 1862. **3** : 317

Wales, a part of the UNITED KINGDOM on its western coast. A mainly mountainous region, it is rich in coal and iron-ore deposits. The capital is CARDIFF. **2** : *148–149*

walkie-talkie, a little radio set which both sends and receives messages and which

one can carry about. It is widely used in military operations, and by police and firemen. **4** : 181

wallaby, a small kangaroo, a pouched mammal of Australia. **1** : 61–62

Wallace, Sir William, the Scottish national hero who began the struggle for independence against the victorious armies of the English king EDWARD I. Finally, he was captured and executed. He lived from about 1272 to 1305. **3** : 127–128

wallflower, a popular garden plant, growing about 18 inches high, and bearing spikes of scented flowers. **1** : 227–229, 235

Walton, Sir William Turner, a vigorous and original English

composer who has produced accompaniments for films and ballets as well as a symphony, concertos and religious music. He was born in 1902. **5** : 251

wapiti, a large form of DEER found in North America, where it is known also as the elk. It should not be confused with the European elk, which is represented in America by the moose. **1** : 23

Warlock, Peter, an English composer and music critic, who wrote many memorable songs. He lived from 1894 to 1930. **5** : 251

warning coloration, a term applied to certain animals which, being poisonous or obnoxious, have outstanding colours or markings which advertise this. The wasp, with its striking markings and powerful sting is one example. Some harmless animals have similar colours and markings to those that are obnoxious and are, as a consequence, left alone. See also MIMICRY. **1** : *294*, 296–299

Washington, George, commander of the American forces against the British during the War of Independence and first President of the United States. He lived from 1732 to 1799. **3** : *2*, 259

wasp, a stinging insect related to the bee, but with a longer, more slender body and more vivid markings. Like bees, most wasps live in a colony of workers with a queen at the head. They do not make honey but feed on caterpillars, spiders, flies, etc. See also HORNET. **1** : 220, 229

water, the liquid covering most of the earth's surface. **4** : 57–68

It is made up of two gases, oxygen and hydrogen (**4** : 63–64), and no living things can exist without it (**4** : 57). Sea-water contains dissolved salts and is therefore denser than rain water and easier to swim in (**4** : 57). Some things, like sugar, dissolve easily in water ; others do not dissolve (**4** : 65–67).

"Soft" water is pure like rainwater ; "hard" water contains dissolved solids which gradually form a "fur" inside the kettle (**4** : 67–68).

water beetle, see BEETLE.

water-birds, birds which swim on rivers and lakes and usually nest in the reeds or nearby. They include the COOT, wild duck, GREAT CRESTED GREBE, MOORHEN and SWAN. **1** : 101–108

water boatman, a water bug which feeds on the larvae of other water insects. It swims on its back, using its third pair of legs as "oars." These legs are much longer than the other two pairs. **1** : *198*, 200

water-colours, a form of painting in which the colouring matter is mixed with water. It is an excellent medium for painting seas and skies and the softer landscapes which have no hard colour contrasts. Compare OIL PAINTING. **5** : 122, *156*, *158*

waterfall, the tumbling of a stream or river over the edge of a height. Usually it is the flowing water that has made the waterfall by eating away the softer parts of the rock of the river bed. Thus a waterfall tends to move upstream as the water undermines bit by bit, and washes away, the rock over which it falls. The Niagara Falls in Canada have the greatest volume of water, but the Victoria Falls in Africa have twice the height. **2** : *92*, 98–101

water flea, a member of the group of animals known as CRUSTACEANS. It has two shells joined by a hinge to protect its body and is found in ponds and ditches. **1** : 225 ; **4** : 331

Waterloo, the battle at which the French army of NAPOLEON was finally defeated by the British and allied forces under the Duke of WELLINGTON in 1815. **3** : *276*, 278

watermark, a faint design impressed in good paper to show its origin. **4** : 294

water pistol, a toy pistol for squirting water. **4** : 69

water power, the force that comes from flowing or falling water to drive machinery. Instead of letting its power go to waste, man has invented WATER-WHEELS and WATER TURBINES which harness its power to work for us. **4** : 78–87, *81–83*

water pressure, the weight of water pressing on anything in it. Divers have to deal with this difficulty when going down deep into the sea **4** : *56*, 57–59

water sprinkler, a device for showering water like rain, used : (1) for watering the garden, (2) for putting out a fire, this second type being attached to pipes along the ceilings of warehouses, etc., and made to work automatically when a fire breaks out. **4** : 85

water system, hot and cold, the arrangement of cistern, tanks, sinks, pipes and taps throughout a house. **4** : 76–77

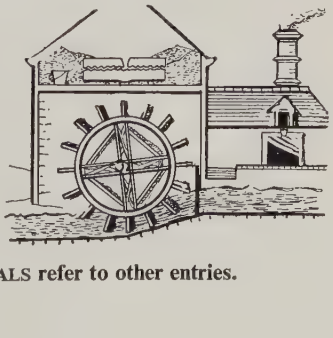
water tower, a large tank on tall supports, used as a special store of water for a neighbourhood, in which water might otherwise run short. It can be filled up during the night when few people are using their water taps, giving a supply throughout the following day. **4** : 76

water turbine, a highly efficient machine developed from the WATER-WHEEL, the falling water being led to it down a huge tube so that none of its power is wasted. The water turbine is mainly used to drive GENERATORS which make ELECTRICITY. You can make a model water turbine for yourself. **4** : 86–87

water vole, a small RODENT living in holes in the banks of streams. It has thick fur and small eyes. **1** : 39

water-weed, any plant with very small flowers and leaves, that grows in ponds. A number of water insects and animals lay their eggs in water-weed. **1** : 177, 199

water-wheel, the part of a water-mill which is turned by the force of a stream and which thereby makes the machinery



in the mill grind corn or do other useful work. **4** : 78–79

waterworks, the place where water is stored, purified and pumped to houses in the neighbourhood for drinking and other purposes. **4** : 72–76

Watson-Watt, Sir Robert, leader of the team of British scientists who invented radar. **4** : 354

Watt, James, a Scottish engineer whose designs were of great importance in the development of the steam-engine. He lived from 1736 to 1819. **4** : 104–109

weasel, an animal related to the stoat, but smaller and thinner. It moves with great speed. It is the smallest animal to prey on other mammals and is a particularly dangerous enemy of rats and mice. **1** : 46–47

weather, the atmospheric conditions resulting from a combination of wind, rain and temperature. See CLIMATE and ATMOSPHERE. **2** : 119–123

weaver bird, a type of bird found in India, Africa and Australia, that makes wonderful hanging nests of grass and fibre. **1** : 93–94

weaving, the process of turning thread into cloth on a loom. **2** : 284 ; **4** : 280–281, *289*

web, see SPIDER.

wedge, a piece of steel or wood shaped like a slice cut from a round cake and used to split or force things apart. **4** : 25

weed, any plant whose growth interferes with other cultivated plants, hence any useless or harmful plant. **1** : 340

To remove these weeds various types of weed-killer (**1** : 337, 355–356) have been invented. Selective weed-killers are those preparations which can be applied to particular plants without damaging others around, as when applied to a lawn to kill the weeds without damaging the grass.

weevil, see INSECT PESTS.

weight, the pull of GRAVITY on an object at rest. Since the moon is about a sixth of the size of the earth, we would weigh on the moon about a sixth of our weight on the earth. **4** : 27–28

Weight is the commonest way of measuring the amounts of many things (**6** : 110). Thus chocolates are sold by the pound, coal by the hundredweight or ton.

weights and measures, the units used for describing size, weight and length. Those in use in Great Britain are very old. See also METRIC SYSTEM. **3** : 318–320 ; **6** : 110–111, 120, 124

Here are some of the more common ones in use today.

Length

12 inches = 1 foot
3 feet = 1 yard
1,760 yards = 1 mile
1 rod, pole or perch = $5\frac{1}{2}$ yards
100 links = 1 chain = 22 yards
10 chains = 1 furlong = 220 yards
8 furlongs = 1 mile

Nautical Measure of Length

6 feet = 1 fathom
608 feet = 1 cable
6,080 feet = 1 sea mile

Area

4,840 sq. yards = 1 acre
640 acres = 1 sq. mile
1 sq. rod or pole = $30\frac{1}{4}$ sq. yards
40 sq. rods = 1 rood
4 roods = 1 acre

Liquid Measure

4 gills = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon

Dry Measure

2 gallons = 1 peck
4 pecks = 1 bushel
8 bushels = 1 quarter

Weight (Avoirdupois)

16 drams = 1 ounce
16 ounces = 1 pound
14 pounds = 1 stone
2 stones = 1 quarter
4 quarters = 1 cwt.
20 cwt. = 1 ton
1 hundredweight (cwt.) is 112 pounds.
1 ton is 2,240 pounds.

welding, a process of joining pieces of steel together. **4** : 258–259

well, a shaft dug deep into the ground down to a supply of water usually filled by an underground spring or a water-soaked layer of rock. **4** : 72 ; **2** : 320–321

Wellington, Arthur Wellesley, Duke of, one of Britain's

greatest military commanders. He drove the French out of Spain and accomplished the final defeat of NAPOLEON at Waterloo. He lived from 1769 to 1852. **3** : 277–279

Wellington, the capital of New Zealand, situated on Cook Strait, North Island. The population is 150,000. **2** : *161*, 334, 337

Wells, Herbert George, an English novelist whose *History of Mr. Polly, Kipps* and *Tono-Bungay* give a realistic and humorous picture of England in the first quarter of the 20th century. Boys and girls enjoy his early scientific romances such as *The First Men in the Moon, The War of the Worlds*

with its men from outer space, and *The Invisible Man,* and his excellent collected *Short Stories* form a treasury of adventure and fantasy. He lived from 1866 to 1946. **5** : 72–73, *74*

Welsbach, Baron von, an Austrian chemist who invented the gas mantle. He lived from 1858 to 1929. **4** : 51

Wesley, John, a famous preacher and founder of the Methodist Church. With the

help of his brother, Charles, he wrote 5,000 hymns. He lived from 1703 to 1791. **3** : 247–249

Westminster Abbey, church where British monarchs are crowned. It was founded by EDWARD THE CONFESSOR but was rebuilt by Henry III with later additions. **3** : 64

whale, a warm-blooded MAMMAL that lives in the sea. Most mammals have hair but the whale has a thick layer of fat, or blubber, under the skin, which is well supplied with blood-vessels. This helps to maintain an even body-temperature. See also WHALING. **1** : 55–58, *59*

There are many kinds of whale, those with teeth and those without. The toothless whales are called whalebone, or baleen, whales and include the Greenland whale (**1** : 55–57), the hump-backed whale (**1** : 57), the rorqual or fin-back whale (**1** : 57). The blue whale, also a rorqual, is the biggest of all living animals (**1** : 57). The toothed whales include the dangerous killer whales (**1** : 58) and the sperm whale, whose

head contains a great cavity filled with oil known as spermaceti, which is valuable for making certain ointments. From this whale also comes the substance called ambergris, which is used in making expensive perfumes (**1** : 57, *59*). Dolphins and porpoises also belong to the group of toothed whales (**1** : 57). The narwhal is one of the dolphin family (**1** : 57–58, *59*).

whaling, the hunting of WHALES by special ships called whale-catchers, chiefly in the Antarctic. A harpoon is a heavy steel dart, attached to a long cable and fitted with explosive. It is fired from a gun on the ship and when it enters the whale it explodes. The dead whale is towed to a factory-ship and hauled aboard to be cut up and the fat boiled down. Whales are caught chiefly for their fat, or blubber, which is used to make soap and glycerine. Other valuable products are whalebone, ambergris, whale-meat. **1** : 56, *59*

wheat, the most important food crop in the world. The grain it yields is ground to make the flour from which bread and many other foods are made. **1** : 328–329, 335, 349–351, 355–356 ; **2** : 328, 334, *332*

wheel, a circular device which made machinery, vehicles and the science of engineering possible. It probably began as a slice cut from a log used as a roller. **4** : 17

wheel animal, see ROTIFER.

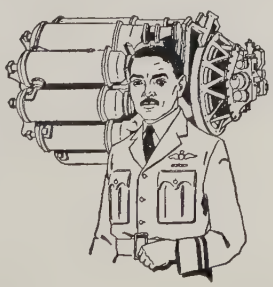
whelk, see MOLLUSCS.

white, the mixture of all the colours thrown back to our eyes by a surface which is not absorbing any of the colours in daylight. A surface which absorbs all the colours in daylight appears black. **4** : 338, *339*

white ant, see TERMITE.

Whittington, Sir Richard, Lord Mayor of London in the reign of Edward IV, who became the hero of a story often used for pantomime. **3** : 178

Whittle, Sir Frank, the inventor of the jet engine. His new engine combined the principles of the rocket and the



turbine and by means of the jet engine aeroplanes were able to go faster than ever before. He was born in 1907. **4** : 119

W.H.O., the abbreviation for the World Health Organization, a branch of the UNITED NATIONS ORGANIZATION. **3** : 359

Wilberforce, William, the most determined opponent of slavery. After 20 years of working against it he managed to get Parliament to end slavery in the British Empire. He lived from 1759 to 1833. **3** : 273–274

wild flowers, see FLOWERS.

William the Conqueror, Duke of Normandy, claimed the throne of England on the death of EDWARD THE CONFESSOR. The

NORMANS invaded England and defeated and killed Harold II at the Battle of Hastings. To advise him in ruling England William had a Great Council of Barons and Churchmen, a step in the direction of Parliament. He reigned from 1066 to 1087. **3** : *2*, 66–70, 78, 121–122, 342

William II, known as William Rufus because of his red hair. He reigned from 1087 to 1100. **3** : 342

William III, was Prince of Orange in Holland when he was invited to become King of England by those who disliked the Roman Catholic policy of the Stuart king, JAMES II. William landed in England in 1688. Several of James's generals deserted and James fled abroad. William was married to James's daughter, MARY, and they were established as joint King and Queen of England, Parliament taking the opportunity to limit the power of the monarchy. He reigned from 1689 to 1702. **3** : 126, 224, 343

William IV, brother of George IV, had been a sailor as a young man. He reigned from 1830 to 1837. **3** : 342

Willoughby, Sir Hugh, tried to discover the north-east passage to India, reached Novaya Zemlya and perished in Lapland in 1554. **3** : 172–173

willow-herb, a woodland plant, creeping along by means of underground shoots. It grows to about 4 feet high and bears elegant pyramids of rosy flowers. 1 : 237

Wimbledon lawn tennis championships, a series of tennis matches played on the grounds of the All-England Club at Wimbledon, consisting of men's and ladies' singles and doubles, and mixed doubles. The championships are open to qualifying amateur tennis players of any nationality, and take place at the end of June each year. 6 : 263

wind, air in motion to the extent that we notice it. It can be a gentle breeze or a gale. See also TRADE WINDS. 2 : 111

windpipe, the narrow pipe which leads from the throat into the lung. 1 : 366

wind power, the energy made by the wind. 4 : 88–91

Windmills are a means of drawing upon this power and making it serve man. They were much used for corn-grinding and are still used in

Holland for draining land. Another wind machine is the wind-pump which is used for raising water.

windsock, a brightly marked device like the leg of a stocking, which, tied to the end of a pole, shows airmen the direction of the wind. Windsocks are used on airfields to assist planes when landing and taking off. 4 : 240

winkle, one of the animals belonging to the group of MOLLUSCS. It has a single shell to protect its body. 1 : 17, 156, 275

winter moth caterpillar, see INSECT PESTS.

wireless, see RADIO.

wireworm, the grub of the click-beetle. See also BEETLE. 1 : 209, 352, 355, 382–383

Witan, the king's council of advisers in Anglo-Saxon times. 3 : 59

Woden, or Odin, was the chief deity in Norse MYTHS. He was god of wind and storm and war. 5 : 14

wolf, a member of the dog family, living in the wild state. It has long legs, a long, pointed muzzle and a bushy tail. The best-known is the timber wolf, found in Canada and Alaska, which may be as much as 4 feet long. 1 : 21

Wolfe, General James, the British soldier who decisively defeated the French in Canada

at the Battle of the Plains of Abraham by Quebec, in 1759. By this victory he made it possible for Canada to develop as a British nation rather than a French possession. He lived from 1727 to 1759, dying in this great battle, as did his French opponent, General Montcalm. 3 : *244*, 245–246, 258

Wolsey, Cardinal, a powerful statesman under Henry VIII. When Wolsey was unable to persuade the Pope to annul Henry's marriage, he was disgraced. He lived from 1472 to 1530. 3 : 161

wombat, a burrowing, badger-like pouched MAMMAL of Australia. 1 : 64–65

wood, see TIMBER.

Wood, Christopher, an English painter who lived from 1901 to 1930. This painter who died so young produced some forty of his best pictures during the last few months of his life. Many of his scenes were set in Cornwall, as is *The Red Funnel*, which shows his strong, bold style, and cheerful use of colour. 5 : 152

woodlouse, a small CRUSTACEAN that belongs to the same group as the freshwater shrimps, but lives on land. It is usually found in damp places, under stones and bark, and in woodwork. 1 : 272, 275

woodpecker, a bird found in most parts of the world excepting Australia and New

Guinea. They are expert tree-climbers. They have strong, hooked claws, and a short tail which is used to help them balance against the tree-trunk. With strong, sharp beaks they bore deep holes in the tree in which to lay their eggs. Their food consists of insects, nuts and berries. The green woodpecker is the biggest of those found in Britain. It seeks most of its food on the ground, where there is a plentiful supply of ants. Others, such as the greater spotted woodpecker and the lesser spotted woodpecker are tree-feeders, finding insects in the cracks of the tree-bark. 1 : *96*, 99–100

wood-pigeon, a bluish-grey bird belonging to the same family as the dove. In Britain it is a pest to farmers, eating their young crops. But it affords sport to the marksman and is good to eat. 1 : *96*, 98

Woodrow Wilson, see LEAGUE OF NATIONS.

wood-wind instruments, see ORCHESTRA.

wool, the material made from the fleece of sheep. It is used in the manufacture of carpets, clothing and textiles. The best wool for these purposes in Britain comes from certain breeds of sheep known as Longwools, which include Leicesters, Lincolns and moun-

tain breeds such as Shetlands and Cheviots.
4 : 278–281 ; **2** : 232, 284–286, 318–324 ; **1** : 352–353

Most sheep are raised in Australia (**2** : 318–324), New Zealand (**2** : 336) and South Africa (**2** : 232). In the summer their fleeces are sheared (**4** : 278), the wool is cleaned and spun into thread (**4** : 279 ; **2** : 285) which, after bleaching and dyeing, is woven into cloth.

woollen industry, the scene of greatest development in Britain during the sixteenth century. **3** : 226–227

Woolsack, a symbolic sackful of wool which is in the House of Lords to remind members of the importance to England of the WOOL TRADE. **3** : 146

wool spinning, the process of turning a sheep's fleece into woollen thread.
2 : 285 ; **4** : 279–280

wool tax, levied by English kings in the Middle Ages on every sackful of wool produced. **3** : 145–146

wool trade, England's main source of wealth in the Middle Ages. **3** : 144–146

Wordsworth, William, an English poet and friend of

Coleridge. He brought a new simplicity to poetry and gives us a sense of the marvellous in the everyday things of Nature which he loved and wrote about. He lived from 1770 to 1850. **5** : 103

workhouse, see POOR PEOPLE.

world, see EARTH.

World War I, a war which broke out in 1914 and was fought with terrible loss of life between Germany, the Austrian Empire and Turkey on one side and the British Empire, France, Russia and Belgium on the other. Eventually many other nations joined one side or the other, including the United States, who joined Britain and her Allies. The main battlefield was in north-eastern France. It ended in the defeat of Germany and the nations allied with her in 1918. **3** : 344–345

World War II, a destructive war in which all the greater nations of the world were engaged. It began in 1939 with Germany's invasion of Poland. Soon German forces occupied almost the whole of Europe, only Great Britain and the Commonwealth standing out against them. Eventually the British Commonwealth, the United States and Soviet Russia were ranged against Germany, Italy and Japan. After fierce fighting in many parts of the world the war ended in the complete defeat of Germany, Japan and their allies in 1945. **3** : *350*, 351–358

worm, an animal without a backbone and without legs. Some live in the earth, some in fresh water, some in the sea, and some as PARASITES in the bodies of other animals. **1** : 16–17, 275

The earthworm (**1** : 16–17) is the best known. It is a ringed worm, which means that its body is made up of rings or segments ; each segment bears several pairs of bristles. It also has strong muscles, so it is able to move about and to burrow into the earth. The earthworm is most useful for the part it plays in mixing and airing the soil. Other ringed worms include the bristle worms that live in the sea, and burrow in sand, and the leeches. There are also flatworms, such as the tapeworm, and roundworms, or threadworms, which live in the bodies of other animals.

wren, one of the smallest birds found in Britain, with an astonishingly loud song considering its size. It is found also in Asia and Europe. The wren builds a dome-shaped nest of moss and leaves with an entrance hole in the side. It dodges in and out of bushes and woody undergrowth in search of insects and caterpillars. **1** : *78*, 92

Wren, Sir Christopher, the great English architect rebuilt St. Paul's Cathedral and 50 City churches after the Great Fire of London. Among his achievements are part of Hampton Court, Chelsea Hospital, and the Royal Naval Hospital, Greenwich. He lived from 1632 to 1723. **3** : 218

Wright, Wilbur and Orville, American inventors of the first power-driven aeroplane. **4** : *231*

writing, the drawing by hand of signs which stand for words so that thoughts can be read with the eye as well as heard with the ear. **4** : 10–11

We learn to write (**6** : 16–18) when we are very young by copying the letters of the alphabet.

Wycliffe, John, a forerunner of the Protestant REFORMATION

in England. His writings were declared to be heretical, but he inspired the translation of the Bible into English. He lived from 1320 to 1384. **3** : 203–204 ; **5** : 41–42

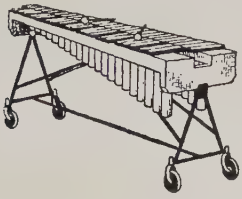
Wyss, Johann Rudolf, a Swiss author who had the happy idea of shipwrecking a whole family on a desert island and making the result an instructional adventure book for

children—*The Swiss Family Robinson*. He lived from 1781–1830. **5** : 69

X

x-rays, see RONTGEN.

xylophone, a percussion instrument consisting of strips of



wood of varying length attached to a frame, the strips giving out different notes when struck. Metal tubes may be suspended from the wooden slats to increase the resonance. **5** : 226

Y

yak, a very large ox found in Tibet, where it is used for transport. It also provides milk and meat for food. Its hide and hair are used in making tents and clothing. **1** : 319–320, *322*

Yangtse-Kiang, the greatest river in China, flows 3,400 miles from Tibet to its mouth near Shanghai. **2** : *158*, 250

Youth Hostels Association, an organization which maintains hostels all over the country at which hikers and cyclists can obtain cheap accommodation for the night. **3** : 347, *349*

Yugoslavia, a mountainous European country in the BALKAN PENINSULA on the eastern shores of the Adriatic Sea. The capital is Belgrade on the River Danube. **2** : *152–153*

Z

Zacchaeus, an unpopular tax-collector of Jericho who listened to JESUS and became His friend. **6** : 205

Zacharias, see GABRIEL.

Zambesi, a river of central Africa, over 1,500 miles long, on which are the VICTORIA FALLS. **2** : *154*

Zarathustra, a Persian religious reformer of the 7th century B.C. He believed in a God of Truth who would reward or punish man according as he chose between the spirits of Good and Evil in this life. This religion survives in that of the Parsees of Persia and India. **6** : *408*

zebra, an animal of East Africa and South Africa, related to the horse. It is famous for its striped coat, which blends well with the background when the animal is moving about amongst the trees. When herds of zebra move across the open plains, however, they are easy prey for lions. **1** : *30*, 34–35 ; **2** : 26

zebra fish, tropical fish found in the Indian Ocean and the Pacific. They are brightly coloured and marked with stripes that help them to blend with their background, and are attractive additions to the home aquarium. **1** : *176*, 177

zebu, a humped MAMMAL found in India, where it is regarded as sacred by the Hindus, and in China and East Africa. Zebus are a form of CATTLE. **1** : 317

Zeus, the Greek name for the god called JUPITER by the Romans. **5** : 9

zoetrope, a Victorian toy which produced the effect of a moving picture. You can make one for yourself. **3** : 307

zoo, a park or enclosure where captive wild animals are kept for exhibition and study. The word is short for "zoological gardens." **1** : 61–67, 116, 120–124, 139 ; **6** : *96*, 97–98, *300*

The study of animals is called zoology. We can learn a lot by visits to the zoo, and by reading books and magazine articles about wild animals. It is a good idea to make drawings as models for yourself, too. Turn to Book 1, page 75 to see how to make a model zoo.

The thick numbers are the numbers of the book to consult; the thin numbers are page numbers.

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counting

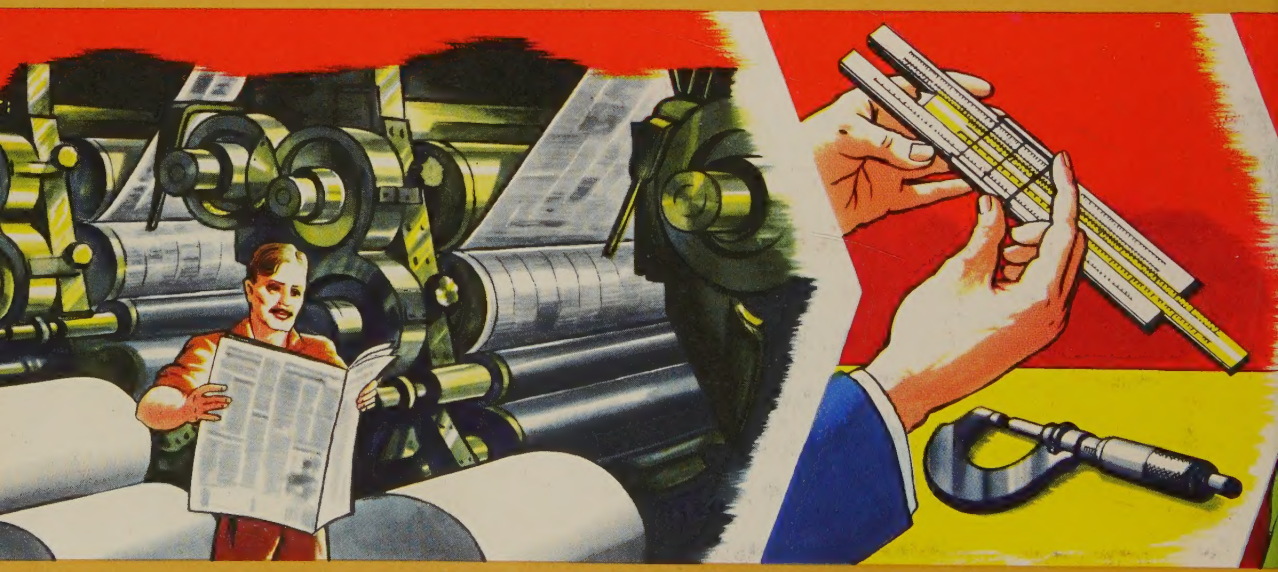
reckoning dates by the moon

the sun tells the time

making new shapes

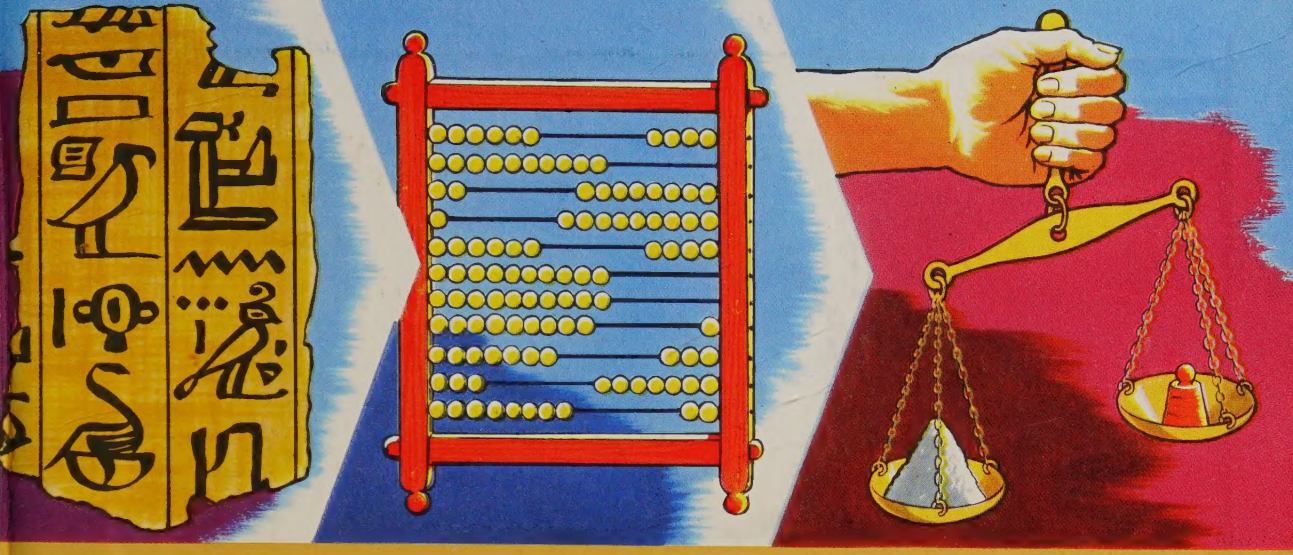
the Latin alphabet

translating the Bible

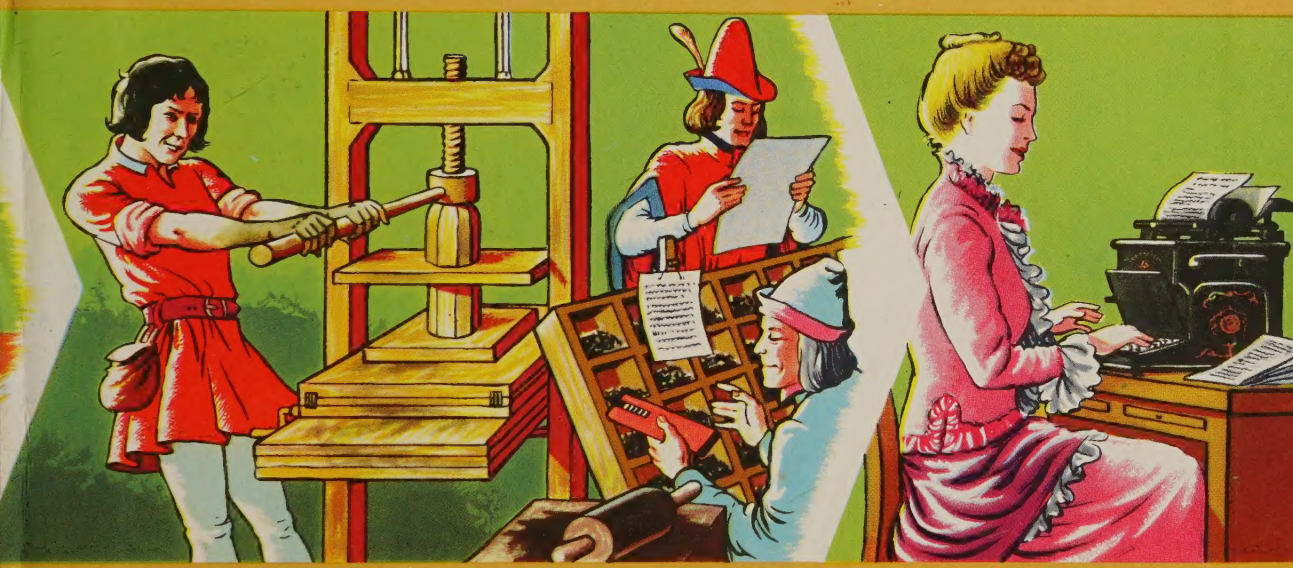


modern newspapers are produced at high speed

measuring instruments



Egyptian writing counting frame scales for weighing



the invention of printing meant more books to read typewriter, a writing machine

film camera sending messages by radio news by television